

C.R.

CITY OF CAMBRIDGE.

ANNUAL REPORT

OF THE

PARK COMMISSIONERS

TO

THE CITY COUNCIL

FOR THE YEAR ENDING NOVEMBER 30, 1893.

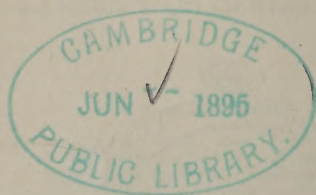


CAMBRIDGE

HARVARD PRINTING COMPANY

1894.

43919



REPORT

OF THE

PARK COMMISSIONERS.



CAMBRIDGE, December 14, 1893.

To the Honorable the City Council of the City of Cambridge :

GENTLEMEN : The Commissioners appointed under the Act entitled "An Act relative to Public Parks in the City of Cambridge" have the honor to submit the following as their first annual report, as required by Section IV. of the ordinance establishing a Park Department.

The organization as a Board was completed on July 31, and since that time the Commissioners have given daily attention to their duties. On October 17 the Commissioners made the following recommendation, which was read in both branches of the City Council, and in concurrence was referred to the Finance Committee :—

To the Honorable the City Council of the City of Cambridge :

GENTLEMEN : The commission appointed under the Act entitled "An Act relative to Public Parks in the City of Cambridge" met for organization July 31, 1893, and at that time voted to secure the services of the well known firm of landscape architects, Messrs. Olmstead, Olmstead & Eliot. These gentlemen visited Cambridge, August 15, 1893, and again on the 22nd of the same month, and examined closely the grounds now owned and devoted to public use by the city. They also examined all the available open spaces, including the entire river front, studying carefully the location and the adaptability of each for the purpose of a broad and comprehensive system of public parks. From the preliminary examination, they submitted on September 30, 1893, a diagram of the city, showing the location of these various lots, together with a brief report suggesting their ideas as to the proper treatment of them.

It was the intention of the Board to make their first report full and complete, mentioning all the different plots of land deemed desirable to

recommend to the City Council, but they find the many details of boundaries, titles, values and rights of individuals will require much more time than they expected.

Owing to this fact, the Board feels it incumbent upon it to call the attention of the City Council to two properties, the Binney field and the Rindge field, upon which they consider immediate action is necessary. These properties were offered to the city through the committee of 1892, upon what was then considered very favorable terms, and the committee at that time unanimously recommended their purchase. Since then the Rindge field has been offered for sale, and advertisements to that effect were placed in the Cambridge papers, but have been withdrawn at the request of the Commissioners. It has also come to their attention that building operations were about to be begun on a portion of the Binney field, a permit for the same having just been granted by the Inspector of Buildings, and further that a block of ground contained within a section of the same field has been offered for sale to other parties.

The Board earnestly feels that these properties should be included in the proposed park system for the city, and in this view they are supported by their advisers, the landscape architects. Therefore they unanimously recommend to the City Council that the city take by right of eminent domain for park purposes that portion of Binney field bounded as follows: Northerly by the southerly side of Cambridge street 528.52 feet; easterly by the westerly side of Berkshire street, proposed, 1087.14 feet; southerly by the northerly side of York street, proposed, 515 feet; westerly by the easterly side of Willow street, proposed, 963.98 feet, containing about 528.154 square feet, including about 59,425 square feet, the area of proposed streets, the same being shown upon a plan of the premises on file in the office of the City Engineer.

The owners of the land included in the areas of proposed Berkshire, York, and Willow streets, which surround the territory named, agree to co-operate with the city in establishing and building these streets to the extent of the cost of filling these streets to grade between their respective abutting lands and to the centre lines of the streets, releasing to the city without consideration the fee in the entire streets; reserving, however, to themselves and to their heirs and assigns, right of way and drainage and all other uses now or hereafter lawful in highways in, through and over such streets.

Also, that the city purchase, for a sum not to exceed \$31,000, a parcel of land offered for sale, situated on the southerly side of Spruce street, being a part of the Rindge field, so-called, described as follows: Beginning at a point in the southwesterly line of Spruce street, 100.62 feet; northwesterly from the southwesterly intersection of Spruce and Groveland streets, thence running northwesterly along said line of Spruce street 342.23 feet, to land now or formerly of Margaret McLean. Thence turning and running southerly along said land of Margaret

McLean and persons unknown 1011.57 feet to northerly location line of Fitchburg Railroad. Thence turning and running southeasterly along said northerly location line of the Fitchburg Railroad 603.67 feet to land now or formerly of Mary A. Davenport. Thence turning and running northerly along said land of Mary A. Davenport 589.36 feet, to land now or formerly of J. B. Remick. Thence turning and running westerly along said land of J. B. Remick and southerly line of Groveland street 170.5 feet, more or less, to the westerly line of Groveland street 276.59 feet to the land of the City of Cambridge. Thence turning and running westerly along said land of the City of Cambridge about 96.5 feet. Thence turning and running northerly along said land of the City of Cambridge 163.8 feet to the point of beginning, containing 501,729 square feet, more or less. Most of this parcel can be used for a park and the remainder devoted to other public purposes or otherwise disposed of

On November 28 the Finance Committee reported orders recommending the appropriation of \$110,000 for the purchase of and the taking of the two parcels of land known as the Binney field, and Rindge field, which orders were approved November 28, and December 1, respectively.

A detailed statement of the expenses of the Department accompanies this report, all of which is respectfully submitted.

| | | |
|-------------------|---|-----------------------|
| HENRY D. YERXA, | } | <i>Commissioners.</i> |
| JNO. O'BRIEN, | | |
| GEO. HOWLAND COX, | | |

Expenditures of the Park Department.

| | |
|--|----------|
| Amount appropriated July 11, 1893..... | \$500 00 |
| Amount expended to December 1, 1893..... | 339 13 |
| Unexpended balance..... | \$160 87 |

The above amount, \$339.13, was expended as follows :

| | |
|---|----------|
| Office furniture..... | \$61 50 |
| Carriage hire..... | 42 00 |
| Stationery..... | 34 48 |
| Door keys..... | 1 15 |
| Olmsted, Olmsted & Eliot, landscape architects..... | 200 00 |
| | <hr/> |
| | \$339 13 |

APPENDIX.

CITY OF CAMBRIDGE, }
IN COMMON COUNCIL, March 29, 1892. }

Ordered: That His Honor the Mayor be requested to petition the General Court now in session for the passage of an Act authorizing the city to borrow, outside of its debt limit, a sum not exceeding two hundred thousand dollars, for the purpose of purchasing and improving lands within the city limits for play grounds and parks for the use of its inhabitants.

[Read once and laid on the table.]

April 5, 1892, taken from the table and amended by adding thereto the following: —

“And further authorizing the city to take, maintain and hold in fee or otherwise, and by gift upon such conditions as the City Council may deem advisable, or by purchase or otherwise, for the purpose of play grounds and parks, such lands with any structures that may be thereon, within the city limits as it may from time to time deem suitable.”

[Passed in Common Council. Came up for concurrence. Read and concurred.]

[Approved by the Mayor, April 13, 1892.]

COMMONWEALTH OF MASSACHUSETTS.

(Chapter 341).

In the year one thousand eight hundred and ninety-two, “An Act to authorize the City of Cambridge to lay out and maintain public parks.” Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows: —

SECTION 1. The City of Cambridge, by its City Council, at any time within three years after the passage of this Act, may take, hold, by purchase or otherwise, any and all such real

estate and lands within said city as it may deem advisable, and may lay out, maintain and improve the same as a public park or parks.

SECT. 2. The said city shall, within sixty days after the taking of any lands and real estate as aforesaid, otherwise than by purchase or gift, cause to be recorded in the registry of deeds for the southern district of the county of Middlesex a description thereof sufficiently accurate for identification, with a statement of the purposes for which the same were taken, which statement shall be signed by the Mayor.

SECT. 3. Said city shall be liable to pay all damages sustained by any persons or corporations by the taking of, or injury to, any of their land, real estate or property, for the purposes aforesaid. If any person sustaining damage as aforesaid does not agree with said city upon the amount of said damage, he may, within one year from such taking, and not afterwards, apply by petition for an assessment of the damage to the Superior Court in said County of Middlesex. Such petition may be filed in the clerk's office of said court, and the clerk shall thereupon issue a summons to the said city, returnable on the first Monday of the next month after the expiration of fourteen days from the filing of the petition, to appear and answer to the petition. The summons shall be served fourteen days at least before the day at which it is returnable, by leaving a copy thereof, and of the petition, certified by the officer who serves the same, with the clerk of said city; and the court may, upon default of hearing of said city, appoint three disinterested persons who shall, after reasonable notice to the parties, assess the damages, if any, which such petitioner may have sustained as aforesaid, together with interest at the rate of four per centum per annum from the date of the actual entry and taking possession of by said city. And the award of the persons so appointed or a major part of them being returned into and accepted by the court shall be final, and judgment shall be rendered and execution issued thereon for the prevailing party, with costs, unless one of the parties claims a trial by jury, as hereinafter provided.

SECT. 4. If either of the parties mentioned in the preceding section is dissatisfied with the amount of damage awarded, as therein expressed, such party may, at the sitting at which

such award was accepted, or next sitting thereafter, claim in writing a trial in said court, and have a jury to hear and determine at the bar of said court all questions of fact relating to such damages, and to assess the amount thereof with interest as aforesaid; and the verdict of the jury being accepted and recorded by the court shall be final and conclusive, and judgment shall be rendered and execution issued thereon, and costs shall be recovered by the parties, respectively, in the same manner as is provided by law in regard to proceedings relating to the laying out of highways.

SECT. 5. In every case of a petition to the Superior Court for an assessment of damages as provided in this Act, the said city may tender to the petitioner or his attorney any sum, or may bring the same into court to be paid to the petitioner, for the damages by him sustained or claimed in his petition, or may in writing offer to be defaulted and that damages may be awarded against it for the sum therein expressed; and if the petitioner does not accept the sum so offered and tendered, with his costs up to that time, but proceeds with his suit, he shall be entitled to his costs to the time of such tender or payment into court, or offer of judgment, and shall not be entitled to either costs or interest afterwards, unless the amount recovered by him in such action exceeds the amount so tendered.

SECT. 6. At any time within two years after any land is taken or purchased for a park or parks under this Act, the Board of Aldermen of said City of Cambridge, if in its opinion any real estate in said city receives any benefit and advantage from such taking or purchasing, or from the locating and laying out of a park or parks under this Act, beyond the general advantages to all real estate in said city, may adjudge and determine the value of such benefit and advantage to any such real estate, and may assess upon the same a proportional share of the cost of land so purchased or taken, and of the expense of laying out, grading and making such park or parks; but in no case shall the assessment exceed one-half of the amount of such adjudged benefit and advantage. Said real estate subject to such assessment may include the remainder of the land of which a part is taken for said public park or parks, and real estate which does not abut upon the park, from the laying out of

which the betterments accrue, or upon a street or way bounded upon such park.

SECT. 7. Assessments made under the preceding section shall constitute a lien upon the real estate so assessed and shall be collected and enforced, with the same rights to owners to surrender their estates, and the same proceedings thereupon, and with the same rights of and proceedings upon appeal, as are provided by chapter fifty-one of the Public Statutes.

SECT. 8. For the purpose of defraying the cost of such real estate and lands as may be purchased, taken or held for the purposes aforesaid, and of constructing the park or parks authorized by this Act, and paying all expenses incident thereto, the City Council of Cambridge shall have authority to issue, in excess of the limit allowed by law, scrip or bonds to be denominated on the face thereof, Cambridge Park Loan, to an amount not exceeding two hundred thousand dollars, bearing interest not exceeding four and one-half per centum per annum, payable semi-annually, the principal to be payable at periods of not more than thirty years from the issuing of such scrip or bonds respectively. Said City Council may sell the same or any part thereof from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value thereof. The provisions of the tenth and eleventh sections of chapter twenty-nine of the Public Statutes shall, as far as applicable, apply to this Act.

SECT. 9. If the City of Cambridge shall accept the provisions of chapter one hundred and fifty-four of the Acts of the year eighteen hundred and eighty-two, and Acts in amendment thereof, and all lands and real estate which may be taken by virtue of this Act shall be under the care and management of the board of park commissioners of said city authorized to be appointed by virtue of said Act.

SECT. 10. This Act shall take effect upon its acceptance by the City Council of Cambridge. (*Approved June 2, 1892.*)

CITY OF CAMBRIDGE, }
IN BOARD OF ALDERMEN, February 21, 1893. }

Ordered: That the Mayor be and hereby is requested to petition in the name and behalf of the City of Cambridge, to the General Court, at its present session, for such further amendments to Chapter 341 of the Acts of the year 1892, in addition to the amendments already petitioned for, which petition is now pending before the Legislature, as will enable the City to borrow for park purposes outside of its debt limit, the sum of \$300,000, in addition to the amount allowed to be so borrowed by said Act.

Sent down for concurrence, February 21, 1893.

In Common Council, February 21, 1893, concurred.

Approved by the Mayor, February 23, 1893.

COMMONWEALTH OF MASSACHUSETTS.

[Chap. 337.]

In the year one thousand eight hundred and ninety-three, "an act relative to public parks in the City of Cambridge." Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:—

SECTION 1. Section one of chapter three hundred and forty-one of the acts of the year eighteen hundred and ninety-two is hereby amended by striking out in the second line, the words "within three years," by inserting in the fifth line, after the word "advisable," the words: "Upon the recommendation of the Board of Park Commissioners hereinafter mentioned," and by adding at the end thereof the words: "The fee of such real estate and lands shall vest in said city," so as to read as follows:—"Section 1. The City of Cambridge, by its City Council, at any time after the passage of this Act, may take and hold, by purchase or otherwise, any and all such real estate and lands within said city as it may deem advisable, upon the recommendation of the Board of Park Commissioners hereinafter mentioned, and may lay out, maintain and improve the

same as a public park or parks. The fee of such real estate and lands shall vest in said city."

SECT. 2. Section eight of said chapter is hereby amended by striking out in the ninth line, the word "two," and inserting in place thereof the word "five," so as to read as follows:—*Section 8.* For the purpose of defraying the cost of such real estate and lands as may be purchased, taken or held for the purposes aforesaid, and of constructing the park or parks authorized by this act, and paying all expenses incident thereto, the city council of Cambridge shall have authority to issue, in excess of the limit allowed by law, scrip or bonds to be denominated on the face thereof, Cambridge Park Loan, to an amount not exceeding five hundred thousand dollars, bearing interest not exceeding four and one-half per centum per annum, payable semi-annually, the principal to be payable at periods of not more than thirty years from the issuing of such scrip or bonds respectively. Said City Council may sell the same or any part thereof from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value thereof. The provisions of the tenth and eleventh sections of chapter twenty-nine of the Public Statutes shall, so far as applicable, apply to this act.

SECT. 3. Said city may make rules for the use and government of such park or parks, and for breaches of such rules affix penalties, not exceeding twenty dollars for one offence, to be imposed by any court of competent jurisdiction; may appoint a police force to act in such parks, and generally may do all acts needful for the proper execution of the powers and duties granted to or imposed upon such city by this act and said chapter; *provided, however,* that no land shall be taken, or any other thing involving an expenditure of money be done under this act or said chapter until an appropriation sufficient to cover the estimated expense thereof shall have been made by a vote of two-thirds of each branch of the city council; and such expenditures shall in no case exceed the appropriations made therefor, and all contracts made for expenditures beyond the amount of such appropriations shall be void.

SECT. 4. All the rights, powers and authority given to the

City of Cambridge by this Act and by said chapter, except for the taking of land and assessment of betterments, shall be exercised by said city, subject to all duties, liabilities and restrictions herein contained, through a board of persons to be appointed by said city, who shall be styled Park Commissioners.

SECT. 5. Section nine of chapter three hundred and forty-one of the Acts of the year eighteen hundred and ninety-two is hereby repealed.

SECT. 6. This Act shall take effect upon its acceptance by the City Council of Cambridge. [*Approved May 12, 1893.*]

CITY OF CAMBRIDGE

711
C14
2

PARK DEPARTMENT.

ANNUAL REPORTS

FOR THE YEAR 1894.



PRINTED FOR THE DEPARTMENT.



SECOND ANNUAL REPORT
OF THE
BOARD OF PARK COMMISSIONERS
OF THE
CITY OF CAMBRIDGE.

To the Honorable the City Council of the City of Cambridge :

GENTLEMEN: — The Board of Park Commissioners have the honor to submit herewith their second annual report for the year ending November 30, 1894, and also the first annual report of the General Superintendent of Parks, as required by Section 4 of the ordinance establishing a Park Department.

On December 19, 1893, the Board submitted the following report and recommendations: —

To the Honorable the City Council of the City of Cambridge:

GENTLEMEN:—The Park Commissioners have the honor to present the following report, which includes their recommendation for the further extension of the park system, also the report of the landscape architects, Messrs. Olmsted, Olmsted & Eliot.

The problem of creating a proper park system for the city is a complicated one. The board have carefully considered the questions of first cost, present necessities and future requirements, and at the same time endeavored to refrain, as far as possible, from destroying income-producing property. In their researches and deliberations they have been guided by the advice and experience of the landscape architects, Messrs. Olmsted, Olmsted & Eliot.

The adjacent city of Somerville is rapidly becoming more compact on our northern boundaries, and the congested districts of our own city are at present tending in that direction. Recognizing this fact, and realizing that within a few years this entire section will be closely built upon, this board recommended the taking of the Binney field in Ward Two and the Rindge field in Ward Five. In securing these two properties, convenient open spaces are provided suitable for places of recreation, and sufficient to meet all the future requirements of the people residing in the vicinity of them.

The western border of the city is protected by Fresh Pond Park, containing 166 acres of water service and 158 acres of land area. The development and improvement of this park is in the hands of the Water Board, and the opportunity is given to them to make it the gem of the entire park system.

Nature has given to the city a golden opportunity in its river, which borders nearly all its eastern and southern boundaries, a river that, if properly treated, will furnish to Cambridge one of the finest water parks in the world. The completion of the Metropolitan system of sewerage will remove the source of its contamination, and, when its waters are again free from filth and noisome smells, its value, in connection with the improvement of its banks, will be beyond estimate. The percentage of its shores occupied by costly buildings is very small; most of the land along its banks can be obtained at the present time at reasonable prices, and the question arises: Shall the city control them and embody them into a park system, or shall they be neglected and be built upon by factories and cheaply-constructed sheds.

The expenditures necessary to secure the control of the entire river-bank will be large, but money spent in this direction is wisely invested. The treatment of the river park should be on generous lines. We must not plan for the present alone, but rather to meet the requirements of the future.

The increase in the value of the taxable property in the vicinity of the park should very nearly pay for its improvement. The experience of other cities has shown that park improvements, when made on a large scale, greatly increase the value of all surrounding property. In the case of Cambridge the scheme proposed by this board is reclaiming, beautifying and making useful large areas of what is now practically worthless property. The result cannot be otherwise than of great advantage to the city, and it is the opinion of this board that immediate steps should be taken to secure these shores.

The question of disturbing the coal business on the river above West Boston bridge has been carefully considered. While this board are not quite sure that any advantage is gained to the city by leaving these coal sheds undisturbed, they feel that there is no necessity for their immediate removal.

Ward Three has no public park or playground. The density of population in this ward, and the fact that its vacant lands are rapidly being built upon, has caused this board to give its first attention to this section of our city. A strip of land 250 feet wide and extending 1,450 feet along the Harbor Commissioner's line can now be secured. Upon this strip a water park with playgrounds for small children, and a suitable bathing beach should be constructed. Commercial avenue should be extended through to Bridge street. This avenue, with the river park, will add vastly to the value of surrounding property and will create a new and desirable residential section in this ward.

The Charles River Embankment Company is rapidly finishing the

construction of about 4000 feet of sea wall and embankment near the Harvard bridge. They have set off for the use of the people a boulevard and parkway 200 feet wide along the entire front of this property. This boulevard should be continued from the westerly line of their property to the Brookline bridge — a distance of 2,400 feet.

Between Brookline bridge and River street there is a large amount of unoccupied territory. This section includes Captain's Island and many acres of marsh land. Property of this character is unsuitable for building purposes, and from its low commercial value it must be a constant menace to the residential section of Ward 4. If taken by the city and improved for park purposes, the entire ward will be benefited. The piece is admirably adapted for a park, affording ample playgrounds, walks and driveways. Its shore can be easily converted into a bathing beach, similar to the one at Marine Park, and boating facilities of the best description given to the public.

At the foot of Boylston street, in Ward One, a condition of things exists that demands immediate attention. The marsh lands are of the poorest description, filthy and obnoxious, and the few buildings now upon them are totally unfit for human habitation. A portion of this territory should be at once taken by the city and reclaimed for park purposes by a method of treatment similar to that proposed for Ward Four. A very desirable attraction to this section of the park system will be the improvement of the ninety acres of land on the opposite side of the river, belonging to Harvard University. By the terms of the gift this property must be forever kept open, and will undoubtedly be the future playgrounds of the college.

At a point near the juncture of the river and Mount Auburn street the land and marshes are at present owned by the Longfellow Memorial Association and Harvard University. These properties should be taken and made a part of the present Longfellow Park.

The approaches to Cambridge, via the Harvard, Brookline and Boylston-street bridges, thus improved and made beautiful, it only remains to properly connect them with the shore drive. This driveway, as proposed by this board, will follow the embankment from Harvard bridge to the Brookline bridge, thence along the shore, across the marshes beyond to River street. From River street to Western avenue it will pass back of the Riverside Press and Cambridge Electric Light station, thence along the river, via a portion of De Wolf and Dyke streets, to a point on Boylston street, just back of the Weld boat house. From Boylston street, the choice of two drives is offered—one by continuing along the shore to Mount Auburn street, which should be widened into a handsome boulevard; the other via Eliot street, Brattle square and Brattle street, — both routes leading to Fresh Pond lane.

This beautiful lane, shaded by many fine trees, offers one of the most attractive approaches to Fresh Pond, and should be included in the park system.

Boylston street is the thoroughfare from Harvard square to the pro-

posed river park, and will be used as such by the public who drive to the river from the direction of North avenue. In consideration of this fact, this board feel it of the greatest importance that this street be made of suitable width from the square to the river.

It is very gratifying to state that the corporate authorities of Harvard University are in hearty sympathy with the efforts of the city to reclaim its shores, and that they have offered their entire shore property upon terms very satisfactory to the board. Many of the private owners of riparian lands have evinced the same spirit of co-operation.

As the result of their study and investigations, this board earnestly recommend that the city take by purchase, or otherwise, certain lands on the Harbor Commissioners' lines, bounded and described as follows, namely :

Beginning at a point in the Harbor Commissioners' line on the northwesterly side of Charles river, between Craigie bridge and West Boston bridge, said point being at the intersection of the said Harbor Commissioners' line with the southwesterly line of a proposed dock or canal, said intersection being about 369 feet southwesterly from the southwesterly line of Bridge street, thence running southwesterly along the said Harbor Commissioners' line about 1,461 feet to a point fifteen feet northeasterly from the intersection of said Harbor Commissioners' line with the southwesterly line of a sixty-foot right of way taken by the City of Cambridge for the purpose of laying and maintaining a common sewer therein, thence running northwesterly along a line parallel with and distant fifteen feet northeasterly from said southwesterly line of said right of way 310 feet to the northwesterly line of a proposed street or way called Commercial avenue, thence running northeasterly along said northwesterly line of said street or way, parallel with and 310 feet distant northwesterly from the said Harbor Commissioners' line about 1,461 feet to the southwesterly line of the dock or canal before mentioned, thence southeasterly along the said southwesterly line of the dock or canal 310 feet to the point of beginning, containing about 452,910 square feet.

Also : a parcel of land belonging to H. M. Whitney, bounded as follows, viz : Northerly by land before taken from H. M. Whitney about 60 ft. Southeasterly by the southeasterly line of a street or way known as Commercial avenue about 683 feet. Westerly by the Easterly line of a street or way known as First street about 137 feet. Northwesterly by the northwesterly line of the above described Commercial avenue about 560 feet. Containing about 37,290 square feet.

Also that Commercial avenue, so-called, running parallel with the Harbor Commissioners' line, be extended from its junction with First street to Bridge street, and that the said avenue be filled to grade and laid out as a public way or street; said avenue to be of a uniform width of sixty feet.

That the city take by right of eminent domain property bounded and described as follows, excepting that part situated between River street and Western avenue, 70 feet wide on the Harbor Commissioners' line, which they recommend be taken by purchase, provided satisfactory prices can be obtained.

Beginning at a point in the southerly line of Mt. Auburn street at its intersection with the division line between land of the Cambridge Hospital and a private street or way known as Scorgie street, thence running easterly along said southerly line of Mt. Auburn street about 1330 feet to the division line between land of the Longfellow Memorial Association and land of the Cambridge Casino Company, thence running southerly along said division line about 158 feet to the tangent point of a curve, thence running southeasterly along said curve of about 80 feet radius, about 79 feet to a point of reversed curvature with a curve of about 5730 feet radius, thence running southeasterly along said curve about 122 feet to a point of reversed curvature with a curve of 20 feet radius, thence running southeasterly and northeasterly along said curve about 40 feet to its tangent point in the northwesterly line of Bath street, thence running southeasterly about 46 feet to a point in the southeasterly line of Bath street at the tangent point of a curve of 30 feet radius, thence running southeasterly along said curve about 30 feet to a point of reversed curvature with a curve of about 5730 feet radius, thence running southeasterly along said curve about 348 feet to a point of compound curvature with a curve of about 1976 feet radius, thence running southeasterly along said curve about 620 feet to the tangent point of said curve, thence running southeasterly along a straight line tangent to the last mentioned curve about 118 feet to the tangent point of a curve, thence running southeasterly along said curve of about 982.6 feet radius about 196 feet to a point of compound curvature with a curve of 20 feet radius, thence running southeasterly and northeasterly along said curve about 38 feet to its tangent point in the northwesterly line of Murray street, thence running southeasterly about 57 feet to a point in the southeasterly line of Murray street at the tangent point of a curve, thence running southwesterly and southeasterly along said curve about 25 feet to a point of compound curvature with a curve of about 588.4 feet radius, thence running southeasterly along said curve about 160 feet to a point of compound curvature with a curve of about 588.4 feet radius, thence running southeasterly along said curve about 160 feet to a point of compound curvature with a curve of 20 feet radius, thence running easterly and northerly along said curve about 30 feet to its tangent point in the proposed northwesterly line of Boylston street, thence running southeasterly about 65 feet to the tangent point of a curve in the southeasterly line of Boylston street, thence running southerly and easterly along said curve of 20 feet radius, about 40 feet to a point of compound curvature with a curve of about 588.4 feet radius, thence running easterly along said curve about 161 feet to a point of compound curvature with a curve of about 1810 feet radius,

thence running easterly along said curve about 142 feet to the tangent point of said curve, thence running easterly by a straight line tangent to the last mentioned curve about 118 feet to the tangent point of a curve of about 1375 feet radius, thence running easterly along said curve about 275 feet to a point of reversed curvature with a curve of 20 feet radius, thence running easterly and northerly along said curve about 33 feet to its tangent point in the northwesterly line of the proposed extension of Holyoke street, thence running southeasterly along the southwesterly line of Dyke street and said line of Dyke street produced northwesterly about 658 feet to the westerly line of DeWolf street, thence running southerly along the westerly line of DeWolf street about 172 feet to a point in a curve of about 800 feet radius, thence running southerly along said curve about 113 feet to a point of compound curvature with a curve of about 1810 feet radius, thence running southerly along said curve about 270 feet to a point of compound curvature with a curve of about 2865 feet radius, thence running southerly along said curve about 85 feet to a point of reversed curvature with a curve of 20 feet radius, thence running southerly and easterly along said curve about 30 feet, thence running southerly about 47 feet to a point in the southerly line of Flagg street at the tangent point of a curve, thence running westerly and southerly along said curve of 20 feet radius about 30 feet to a point of reversed curvature with a curve of about 2865 feet radius, thence running southerly along said curve about 209 feet to a point of compound curvature with a curve of about 1810 feet radius, thence running southerly along said curve about 108 feet to a point of reversed curvature with a curve of 20 feet radius, thence running southerly and easterly along said curve about 28 feet to its tangent point in the northerly line of Stiles street, thence running southerly about 41 feet to a point in the southerly line of Stiles street at the tangent point of a curve, thence running westerly and southerly along said curve of 20 feet radius about 30 feet to a point of reversed curvature with a curve of about 1810 feet radius, thence running southerly along said curve about 335 feet to the southerly tangent point of said curve, thence running southerly along a straight line tangent to the last mentioned curve about 130 feet to the tangent point of a curve, thence running southerly and easterly along said curve of 20 feet radius about 32 feet to the tangent point of said curve in the northerly line of Sands street, thence running southerly about 40 feet to a point in the southerly line of Sands street at the tangent point of a curve, thence running westerly and southerly along said curve of 20 feet radius about 31 feet to a point of compound curvature with a curve of about 6251 feet radius, thence running southerly along said curve about 230 feet to a point of compound curvature with a curve of 20 feet radius, thence running southerly and easterly along said curve about 31 feet to its tangent point in the northerly line of Western avenue, thence running southerly about 68 feet to the tangent point of a curve, thence running westerly and southerly along said curve of 20 feet radius about 28 feet to a point of compound curva-

ture with a curve of about 6251 feet radius, thence running southwesterly along said curve about 360 feet to a point of compound curvature with a curve of about 14,947 feet radius, thence running southwesterly along said curve about 541 feet to a point of compound curvature with a curve of 20 feet radius, thence running southerly and easterly along said curve about 38 feet to its tangent point in the northwesterly line of River street, thence running southwesterly about 62 feet to the tangent point of a curve in the southeasterly line of River street, thence running southwesterly along said curved line of 20 feet radius about 28 feet to a point of compound curvature with a curve of about 14,947 feet radius, thence running southeasterly along said curve about 860 feet to a point of compound curvature with a curve of about 3820 feet radius, thence running southeasterly along said curve about 418 feet to a point of compound curvature with a curve of about 1228 feet radius, thence running southeasterly along said curve, about 595 feet to the point of compound curvature with a curve of 20 feet radius, thence running easterly and northerly along said curve to its tangent point in the northwest line of Magazine street about 35 feet, thence running southeasterly about 52 feet to a point in the southeasterly line of Magazine street, thence running northeasterly along the southeasterly line of Magazine street about 206 feet to the southwesterly line of Granite street, thence running southeasterly along the southwesterly line of Granite street about 480 feet to the northwesterly line of Pearl street, thence running southwesterly along the northwesterly line of Pearl street about 45 feet to the southwesterly line of a passageway, thence running southeasterly along said southwesterly line about 534 feet to the westerly line of Brookline street, thence running southerly along the westerly line of Brookline street about 270 feet, thence running southeasterly about 102 feet to the tangent point of a curve in the southeasterly line of Brookline street, thence running southerly and easterly along said curve of 80 feet radius about 105 feet to a point of compound curvature with a curve of about 1,976 feet radius, thence running southeasterly along said curve about 756 feet to a point of compound curvature with a curve of about 3,820 feet radius, thence running southeasterly along said curve about 480 feet to a point of compound curvature with a curve of about 1,976 feet radius, thence running southeasterly along said curve about 510 feet to a point of compound curvature with a curve of about 2,292 feet radius, thence running easterly along said curve about 180 feet to a point of compound curvature with a curve of 20 feet radius, thence running easterly and northerly along said curve about 32 feet to a point in the southwesterly line of the proposed extension of Putnam avenue, thence running east about 50 feet to the tangent point of a curve in the northerly line of the proposed extension of Putnam avenue, thence running southerly and easterly along a curved line of 20 feet radius about 32 feet to the tangent point of said curve, thence running easterly parallel to and 200 feet distant northerly from said Harbor Commissioners' line

about 130 feet to the division line between land of Jennie G. Carter and land of the Charles River Embankment Company, thence running southeasterly and southerly along said division line about 215 feet to the said Harbor Commissioners' line, thence running in a generally westerly direction along said Harbor Commissioners' line of Charles River about 14,070 feet to the division line between land of the Cambridge Hospital and the above named Scorgie street, thence running northeasterly along said division line about 243 feet to the point of beginning; containing about 3,448,849 square feet.

The above described parcel of land is shown on a plan entitled "Plan of Proposed Charles River Parkway" drawn by L. M. Hastings, City Engineer, and dated December 5, 1892, and on file in the office of the City Engineer of Cambridge.

The above parcels of land are shown on a plan entitled: "Plan of proposed Charles River Parkway," drawn by L. M. Hastings, City Engineer, and dated December 5, 1892, and on file in the office of the City Engineer of Cambridge.

They further recommend that Mt. Auburn street, west of Bath street, be widened to a width of 100 feet. Also that Boylston street, from Harvard square to the Charles River, be widened to at least 60 feet.

The Board fully appreciate the great attractiveness of Shady Hill or Norton's Woods, and the desirability of including it in the park system of Cambridge. At present, however, the necessity for the improving and reclaiming the shores of the river are more apparent, and in their opinion their first duty is to draw your attention in this direction. A recommendation as to Norton's Woods, and establishing a series of driveways from the various sections of the city, converging at Fresh Pond Park, will later be submitted for your consideration.

Respectfully submitted.

HENRY D. YERXA,
JNO. O'BRIEN,
GEO. HOWLAND COX,
Commissioners.

On January 23, 1894, the Finance Committee of the City Council reported an order for the taking of the lands recommended in the above report, and also the following order, both of which were adopted unanimously by both branches of the City Council:

CITY OF CAMBRIDGE, }
IN BOARD OF ALDERMEN, January 23, 1894. }

Ordered: That the sum of two hundred and fifty thousand dollars is hereby appropriated for Park purposes, under the provisions of Chapter three hundred and forty-one of the Legislative Acts of the year 1892, entitled "An Act to authorize the City of Cambridge to lay out and

maintain public parks;" and also of Chapter three hundred and thirty-seven of the Legislative Acts of the year 1893, amendatory thereto, entitled "An Act relative to Public Parks in the City of Cambridge."

Said sum to be provided for by a city debt to be hereafter created under authority of the aforesaid Acts.

Adopted by a ye and nay vote, the full Board voting in the affirmative.

Sent down for concurrence. January 23, 1894, concurred. January 25, 1894, approved.

In the annual budget, which was approved February 28, 1894, this appropriation was increased to four hundred and twelve thousand dollars.

PARK CONSTRUCTION.

CAMBRIDGE FIELD.

In beginning the work of our park development, the Commissioners were strongly of the opinion that the needs of the most thickly-settled portion of our city should be first cared for. With that view, work was begun early in June upon Cambridge Field, and has since been pushed as rapidly as is consistent with economy and good results.

The City Engineer estimated that 75,000 cubic yards of filling would be required to bring the field up to the grades established by Olmsted, Olmsted & Eliot in their plan accepted by the Commissioners. It was found that it was impossible to make a contract for filling with the railroad, which was satisfactory to the Board, hence it was decided to make the attempt to fill the field by the aid of teams. The wisdom of this course has been proven by the success attained. Since the 20th day of June, 28,265 loads of filling have been put upon the field, exclusive of the street scrapings and ashes dumped by city carts, at an expense of about one-half the price submitted by the railroad. Employment has thus been given to many men and teams that, owing to the continued business depression, might otherwise have been idle.

The Cambridge street sidewalk fronting the field has been excavated, and the planting spaces filled with loam and are now ready for the trees. Berkshire and Willow streets at their

junction with Cambridge street have been paved, and cross walks laid. The circles and curbs for the corners of both streets have been put in, and the curbing extended along Berkshire street 390 feet and along Willow street 400 feet.

It is the purpose of the Commissioners to bring both Berkshire and Willow streets to grade during the coming winter, and there is reason to believe that a considerable portion of the planting space on the field will be in readiness for the planting of trees and sowing of grass seed early in the spring of 1895.

At a meeting of the Board held on September 26, 1894, it was, after due consideration, unanimously voted to name this reservation Cambridge Field. Other names of a local character had been suggested; but it was thought to be more appropriate that this first enterprise in the new era of park development should have a name no less comprehensive than the entire municipality. As the field fronts upon Cambridge street, the name Cambridge Field is a natural one. It gives new emphasis to a name which every citizen loves to repeat, and when the park is completed will add new honor to the city.

RINDGE FIELD.

The work done on Rindge Field during the summer has been such as was necessary to put it in condition to be used as a ball field and playground. A few hundred loads of filling were put upon the field, and the necessary grading done. The unsightly board fence has been replaced by one similar to that used around Fresh Pond.

The Field has been largely used throughout the summer, and is filling a long-felt want in Ward Five.

RINDGE FIELD NURSERY.

In order to secure trees of the proper variety and size for successful planting when needed, the Commissioners established a nursery on a portion of Rindge Field. The result has been exceedingly gratifying. Twenty-five hundred young trees have been placed there, and they are in a thrifty condition.

This nursery will be of the greatest advantage for park and

street planting, as young and vigorous trees will be always obtainable when required. The Commissioners estimate that by establishing this nursery a large pecuniary benefit will result to the city.

EAST CAMBRIDGE EMBANKMENT.

No work has been done on the East Cambridge river park, as the method of treatment cannot be determined until the matter of the proposed damming of the Charles river has been settled.

THE ESPLANADE.

The Charles River Embankment Company have had dredges at work all summer, filling the flats on the easterly side of Harvard bridge, and it is probable that their work will be completed during the summer of 1896. The esplanade established along the water front of their property should be extended to West Boston bridge. The Commissioners are negotiating with the owners of intervening flats, with the hope that some satisfactory agreement may be arrived at, to bring this about.

CAPTAIN'S ISLAND PLAYGROUND AND THE RIVER ROAD.

The Park Engineers have made soundings and the necessary surveys along the river takings, and a considerable amount of filling has been put upon the proposed river drive; but the treatment of the shores, like those of the East Cambridge Embankment, must await the decision as to the proposed dam.

II. SQUARES AND PUBLIC GROUNDS.

DANA SQUARE.

The Commissioners have given much thought and study to the treatment of the squares and public grounds, but the limited appropriation available precludes very rapid development of the plans for their improvement.

Believing it is wiser to complete the planing of the squares each

in turn, such sums as could be spared from the appropriation for the purpose have been applied to Dana Square in Ward Four. The fence surrounding the square has been repaired, the plan of walks changed, the lawn graded and resodded, trees planted, and beds of shrubbery laid out.

The improved appearance of the square is very marked.

BROADWAY PARK.

At the request of the Commissioners, Olmsted, Olmsted & Eliot have prepared plans for the artistic treatment of Broadway Park, in place of the stiff, straight walks, misplaced trees and poor turf now there. This park is very largely used through the summer months by women and children, and a move in the direction of making it more useful and at the same time more attractive will be of very great benefit.

The expense of the proposed improvement is estimated at \$4,500, and the Commissioners earnestly urge that a special appropriation for this amount be made the coming year.

HASTINGS SQUARE.

The usual work of the gardener has been carried on through the summer. A great improvement in the appearance of the square can be made by thinning out and relocating the trees and shrubs that have been placed there regardless of effect or good results.

FORT WASHINGTON.

The grounds within the enclosure have been cleaned up and the fence has been repaired. This fort is one of the sacred relics of our local colonial history, and as such should and will receive later the proper attention due to it.

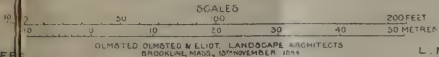
CAMBRIDGE COMMON.

The condition of the common is such that it will soon require radical measures for its treatment. The soil is poor, greatly lacking in loam, and the trees do not thrive as they should. It seems a pity that a piece of ground so centrally located

CITY OF CAMBRIDGE ——— PARK COMMISSION

BROADWAY SQUARE

GENERAL PLAN

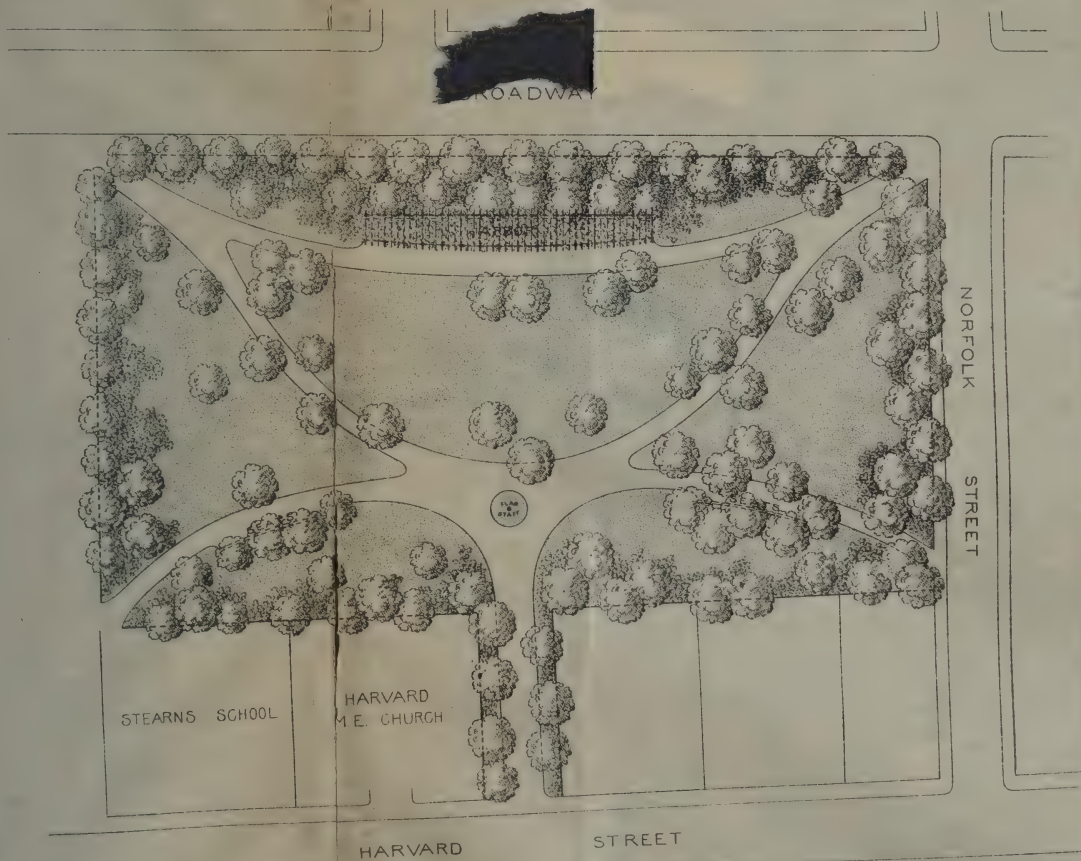


HENRY D. YERXA, CHAIRMAN,
JOHN D'BRIEN,
GEORGE H. COX.

COMMISSIONERS.

OLMSTEAD OLINSTEAD & ELIOT, LANDSCAPE ARCHITECTS
BROOKLINE, MASS., 15th NOVEMBER 1914

L. M. HASTINGS,
CITY ENGINEER.





STREET

It seems a pity that a place of
such importance should be so
neglected in regard to the
improvement of the street.

should not receive such care as may be necessary to produce the best results.

The attention of Dr. Sargent of the Arnold Arboretum has been brought to its trees, and the commissioners have had the benefit of his advice.

The Board questions the wisdom of longer allowing the use of a portion of the common as a playground for the rough sports of men and boys. Playgrounds for base ball and foot ball have recently been provided on Rindge Field, and during the summer vacation months, the University authorities have granted the use of Holmes Field to the boys. Many complaints have been made as to the danger to life and limb to those passing through the Common, and for this reason it is shunned by some of our people who would otherwise gladly use it.

WINTHROP SQUARE.

Plans for the improvement of Winthrop square are being considered, and only await the action of the City in the matter of the Boylston street widening, for their completion.

PUBLIC GROUNDS.

With the exception of the gardening done around the Public Library and City Hall, but little effort has been made in the past to adorn the grounds about our public buildings. It is the purpose of the Commissioners to give this matter their serious consideration.

There is no good reason why the grounds about our school houses should not be maintained similar to those about private residences; but it will require co-operation on the part of teachers and pupils.

The Commissioners believe that work done in this direction will meet with its just appreciation from the children, and that school pride and the feeling of personal ownership which will be developed in the mind of each pupil will be sufficient to protect the school grounds.

Education obtained through daily contact with cultivated

surroundings cannot but help mould the character of children, and make its mark distinctly upon them, when they grow to manhood or womanhood.

SHADE TREES.

Cambridge has many beautiful trees, but it is quite evident to any observer that those along our city streets have not had the care and protection necessary to preserve them. Preyed upon by man and by beast, it is a wonder that any survive.

Although much more work than usual has been done upon them during the past year, only a beginning has been made in the proposed plans for their future treatment.

The Board would consider it wise economy to increase somewhat, for the next few years, the annual appropriation for shade trees. A system of inexpensive guards for the trees could thus be completed, and many valuable trees saved which will otherwise be lost. The removal of many objectionable trees might also be effected were there more money available. A system of planting upon the new streets might also be carried out. The department is now in good working order, and is well equipped to perform tree work with economy and intelligence. The Board, therefore, recommend, that the usual appropriation of \$7,000 for shade trees and public grounds made in former years be increased next year to \$9,000. This sum would also enable the Board to carry out the plan of finishing the grounds around the Morse schoolhouse, and the improvement of some of the public squares.

III. RELATED MATTERS.

BOYLSTON STREET.

The Commissioners have recommended that Boylston street be widened from Harvard square to the river. This street is the natural outlet from the centre of the city to the proposed river parkway, Soldiers Field, and the section of country beyond, and the thoroughfare that will be most convenient to the people living in that large section of our city to the northward of Harvard square.

This widening can never be done in the future as cheaply as at this time, and the change in the character of the street which will surely follow these improvements, is absolutely necessary to the establishing of an attractive entrance to the city, and the protection of the park developments along the river in its vicinity.

BUILDING LINES.

The Commissioners again draw attention to Chapter 462 of the Acts of 1893, and recommend that the same be applied to Huron avenue, and that a building line of twentyfive feet be there established. This is a newly laid out street and but little built upon. By co-operation on the part of the city and the owners of land abutting upon it, this street can be made one of the most attractive in the city.

It would be a wise act on the part of the city to at once establish a proper building line upon every new street, that is in the future to be laid out.

SIDEWALKS.

The sidewalks of the city are not under the charge of the Park Department, but it may not seem amiss if the Commissioners express their opinion that many of the streets of the city would be rendered much more attractive if a planting space of at least eighteen inches be left between the curb and the outer edge of the brick or concrete, that is laid upon the sidewalk. It would lessen expense of construction, and aid materially in preserving the shade trees.

POLES AND WIRES.

The general public have taken but little active interest in any efforts to regulate the size, shape and appearance of the poles erected throughout the city for the purpose of carrying electric wires, and it cannot be expected that any radical changes can be made at present. Time alone will regulate the matter. In the public squares however, an effort made to substitute in the place of those now there, iron poles of artistic design would certainly meet with the general approval of the citizens, and should create no opposition from the electric companies.

BRIDGES.

The bridges across the Charles are not in keeping with the wealth of Boston and Cambridge. Cheap in construction, ugly in design, they stand as monuments to the builders whose ideas were solely utility for present needs. As they stand, they should remain, until the necessary money can be appropriated to rebuild from designs and under the direction of competent bridge architects and engineers.

The present Cottage Farm bridge will soon be rendered practically useless on account of the raising of the grade of the street on the Boston side of the river. The landscape architects have recommended that instead of rebuilding this bridge in its present location, it be re-located at a point 1,000 feet below and crossing and connecting with Audubon Road. They also recommend the building, later, of a second bridge, crossing the river from a point just below Captains Island.

IV. FINANCIAL REPORT.

The financial report for this department for the year ending November 30, 1894, is as follows:

PARK LOAN.

| | |
|---|--------------|
| Amount appropriated, Feb. 28, 1894 | \$412,000.00 |
| Revenue appropriated, Nov. 21, 1894 | 946.21 |
| | <hr/> |
| | \$412,946.21 |

EXPENDED.

CAMBRIDGE FIELD:

| | |
|-------------------------------------|-------------|
| Land | \$63,700.00 |
| Filling material | 9,922.52 |
| Loam | 1,216.05 |
| Labor | 3,351.76 |
| Teaming | 675.99 |
| Tool house | 74.17 |
| Examination of titles, etc. | 120.15 |
| Printing | 37.00 |
| Edgestones | 204.41 |

| | | |
|--------------------------------|-------------------|--------------------|
| <i>Amounts carried forward</i> | <hr/> \$79,302.05 | <hr/> \$412,946.21 |
|--------------------------------|-------------------|--------------------|

Amounts brought forward . . . \$79,302.05 \$412,946.21

| | |
|----------------------------|--------|
| Drain pipe | 161.42 |
| Engineering Account . . . | 223.50 |
| Gravel | 355.00 |
| Manure | 55.50 |
| Stove and fixtures | 11.35 |
| Shovels | 9.36 |
| Lumber | 9.40 |
| Paving stone | 74.00 |
| Flagging | 79.38 |
| Catch basins. | 75.35 |
| Oil | 7.11 |

\$80,363.42

RINDGE FIELD:

| | |
|---------------------------------|-------------|
| Land | \$31,420.00 |
| Examination of titles, etc. . . | 41.85 |
| Filling material | 344.50 |
| Fence | 639.37 |
| Repairs on fence | 1.90 |
| Tool house and back stop . . . | 81.44 |
| Labor | 1,100.46 |
| Teaming | 148.50 |
| Grass seed | 6.50 |
| Advertising | 67 |

\$33,785.19

RIVER PARKWAY:

| | |
|---------------------------------|-------------|
| Lands | \$83,665.15 |
| Examination of titles, etc. . . | 678.39 |
| Insurance | 119.00 |
| Engineering account | 765.76 |
| Boat hire and boatman | 163.75 |
| Filling material | 623.40 |
| Loam | 141.45 |
| Labor | 445.75 |

\$86,602.65

THE "FRONT:"

| | |
|---------------------------------|-------------|
| Land | \$45,144.00 |
| Examination of titles, etc. . . | 82.40 |
| Engineering account | 16.50 |
| Boat hire and boatman | 32.50 |
| Labor | 9.00 |

\$45,284.40

NURSERY:

| | |
|-----------------|----------|
| Trees | \$738.45 |
|-----------------|----------|

Amounts carried forward \$738.45 \$246,035.66 \$412,946.21

| | | | |
|--------------------------------------|----------|--------------|--------------|
| <i>Amounts brought forward</i> . . . | \$738.45 | \$246,035.66 | \$412,946.21 |
| Labor | 199.36 | | |
| Freight | 47.90 | | |
| Teaming | 20.25 | | |
| Fence | 136.96 | | |
| Castings for catch basin . . | 4.95 | | |
| | <hr/> | \$1,147.87 | |

OFFICE EXPENSES:

| | | | |
|---------------------------|----------|----------|--|
| Salary of clerk | \$224.00 | | |
| Furniture | 189.00 | | |
| Stationery | 169.73 | | |
| Printing | 118.42 | | |
| Typewriter | 112.50 | | |
| Atlas | 25.00 | | |
| Directory | 3.00 | | |
| | <hr/> | \$841.65 | |

GENERAL ACCOUNT:

| | | | |
|---|------------|------------|--------------|
| General Superintendent's salary | \$1,075.00 | | |
| Tools and hardware | 646.37 | | |
| Horse | 200.00 | | |
| Carriage | 160.00 | | |
| Harness | 75.00 | | |
| Board of horse, repairs, equipments | 280.30 | | |
| Typewriting | 21.55 | | |
| Advertising | 33.20 | | |
| Printing | 183.75 | | |
| Clerical services | 30.00 | | |
| Lumber | 52.87 | | |
| Car tickets | 60.00 | | |
| Boat hire and boatman . . . | 153.25 | | |
| Boat | 41.00 | | |
| Raft | 47.49 | | |
| Stakes | 45.75 | | |
| Photographs | 43.50 | | |
| Sundries | 85.03 | | |
| | <hr/> | \$3,234.06 | |
| | | <hr/> | \$251,259.24 |
| Balance unexpended | | | \$161,686.97 |

SHADE TREES AND PUBLIC GROUNDS.

| | |
|---|-------------------|
| Balance received from Street Department, March 12, 1894. | \$5,502.09 |
| Revenue appropriated Nov. 21, 1894 | 17.19 |
| Appropriation for Morse School house grounds, Nov. 21, 1894 | 1,000.00 |
| Total | <u>\$6,519.28</u> |

EXPENDITURES.

| | | |
|--|------------|-------------------|
| Labor | \$4,009.87 | |
| Teaming | 132.88 | |
| Horse | 50.00 | |
| Boarding horse | 70.00 | |
| Shoeing horse | 13.77 | |
| Loam | 262.55 | |
| Trees deciduous | 213.00 | |
| Trees coniferous | 24.56 | |
| Shrubs | 44.38 | |
| Plants | 115.00 | |
| Bulbs | 84.98 | |
| Wire netting | 237.39 | |
| Work on flag staffs | 27.50 | |
| Lumber | 46.24 | |
| Repairing fence at Broadway square | 30.00 | |
| Repairing fence at Dana square | 35.00 | |
| Flower boxes | 17.00 | |
| Tools | 23.22 | |
| Hardware | 2.10 | |
| Poles for trees | 75.00 | |
| Old garden hose | 4.50 | |
| | <u></u> | \$5,518.94 |
| Balance unexpended | | <u>\$1,000.34</u> |



REAR OF BEACON STREET, BOSTON, SHOWING PRESENT CONDITIONS AT LOW TIDE.

THE HELIOTYPE PRINTING CO., BOSTON.

PART SECOND

OF THE

Annual Report of the Board of Park Commissioners

OF THE

CITY OF CAMBRIDGE

PROPOSED DAMMING OF CHARLES RIVER.

Those best acquainted with river scenery are unanimous in the opinion that among the streams flowing through large cities, the Charles is of special interest, both from its present natural beauties and its artistic possibilities. Nature has omitted nothing from the perfect design of a quiet river flowing through marshes from hills to the sea. The broad expanse of water, narrowing and winding as the eye traces its course to the western distance, reveals beauties which are a delight to the lover of nature and a source of inspiration to the artist. Even the ugly architectural deformities along portions of its banks, and the desolate reaches of marshes and mud flats, made repulsive by sewage flow and tidal débris, cannot altogether hide the beauties of the stream.

The element of beauty is the most valuable element of the Charles. Other cities have discovered that the æsthetic character of an urban river is that which pays the largest dividends back to the public treasury. The cultivation of beautiful reaches of water in the midst of a populous community attracts wealth and results in large permanent taxable values.

The higher use of the Charles — to beautify a great community — is the final use to which the river will be put. All other uses are but temporary or incidental. The river's chief value in the future must come from a practical use of its æsthetic

quality, and when this principle is fully recognized in the development of the latent resources of this metropolitan district, the Charles will be found to be one of the most profitable of all those resources.

THE PROPOSED DAM.

The Commissioners have given much time and attention to the matter of the proposed dam near Craigie's bridge, recommended by the Joint Board upon the improvement of Charles River, with special regard to the commercial interests and the sanitary questions involved as affecting the welfare of Cambridge.

The first Charles River Improvement Commission in its report to the Legislature of 1893 says: "The commerce of the river has not kept pace with the population in the neighborhood of the stream." This is undoubtedly true, and we have evidence of the fact in Cambridge, where riverlands suitable for commercial purposes have recently been valued for taxation at from one and one-half cents to five cents per foot, and where a fine wharf property has lately been abandoned because, as the tenant said, "he could not compete with railroad service."

The commercial value of the river has been shown by experience to be entirely one of theory, as its tonnage has not materially increased in the past fifty years. But the existing business will probably remain, and the construction of the dam — thereby retaining the water at a constant level — will enable its being conducted more economically than it is at present.

Navigation will be made possible at all stages of tide, thus avoiding expensive and tedious delays, and there will no longer be the danger of injury to vessels from settling in the mud, as is now liable at every low tide.

A constant level of water in the river will greatly increase its use for pleasure boating, as well as its more practical use as an avenue of travel. A line of electric launches and small steamers, making regular trips through the summer months between Boston, Cambridge, Brighton and Watertown, will serve a double purpose: that of furnishing another means of transportation, and that of affording to all those who, from various circumstances are forced to remain at home through the hot months of summer, the opportunity of enjoying at a low price, the fresh cool

air of the river. The formation of ice in the basin during the winter months will not materially affect the commercial interests of the river; it will only be necessary to anticipate winter needs, as is customary on all navigable fresh water streams. From the drawtender's report for last winter it is found that but sixteen cargoes passed through West Boston bridge during the three months that ice would be likely to form in the basin, and but four of these went above Harvard bridge.

It is from the industrial rather than the commercial side of the question that the value of the river should be considered. In this connection Mr. E. D. Leavitt, the well-known engineer, writes to the Commissioners as follows:—

The dam would be of the greatest benefit to all industrial establishments located along or near the river, from the fact that it would give them a practically unlimited supply of fresh water, where they now have to pay for water from the drinking-water supply of the various cities adjoining the Charles. The most economical steam engines built will use 12 pounds of water per horse power per hour. A good compound condensing engine will use nearly 15 pounds per horse power, while the great majority of moderate sized commercial engines (non-condensing) will use at least 30 pounds per horse power.

At the latter rate a 100-horse power engine will use practically 3600 gallons per day of ten hours, which at current Cambridge meter rates will make the cost for water for a 100-horse power engine about \$216 for a year of 300 working days. The difference between this and a free supply needs no comment. The city water works do not need the revenue derived from the sale of water for industrial purposes, and as the supply of water for drinking is constantly diminishing, every gallon of drinking water that can be kept out of boilers is a direct gain to the cities as well as to the steam consumer.

Where condensing engines are used, it is now necessary to use a surface condenser (a comparatively costly apparatus) or to use city water for feeding boilers, because if a jet condenser be used, the fresh water of condensation is mixed with the salt condensing water from the river. The city water will average throughout the year not over 60 degrees Fahrenheit in temperature. The water discharged from a jet condenser should have a temperature of from 100 to 110 degrees Fahrenheit, or say an average of not less than 45 degrees above city water temperature. A difference of about 11 degrees in the temperature of feed water makes a difference of 1 per cent. in fuel required.

Therefore, if feed water for boilers can be taken from condenser discharge instead from the city mains, there will be a gain of at least 4 per cent. in fuel, in addition to the gain from free fresh water.

There are comparatively large areas along the river that are not yet piped for city water distribution, as, for instance, the newly filled-in lands along the Cambridge shore near the Harvard Bridge, and partly filled lands between the West Boston and Craigie Bridges. The size of water mains in a given district is not determined by the supply needed for domestic purposes, but by that needed for fire protection. Domestic supply mains, particularly along the outskirts of a town, can be much smaller, and therefore cheaper, than those needed for the fire department. If the water in the river be kept constantly at a high level, as proposed, then such districts as I have mentioned will have an inexhaustible supply for fire protection close at hand. The fire engine can draft direct from the river, or for fires further back can draft from the storm-water sewers, and the municipalities will be saved the cost of piping for fire supply.

The proposed fresh water basin could furnish an enormous ice supply; which, although perhaps not pure enough for drinking, would be worth many thousands of dollars annually for butchers' and grocers' use, and for like purposes; thus eking out our fast decreasing local supply.

If, as I understand, objections have been made to the dam as obstructing commerce, then I must say that the objectors are standing in their own light. Hundreds of millions of dollars have been spent for producing artificially just such basins for the promotion of commerce; as, for instance, the West India docks, Victoria docks and Tilbury docks, of London; the docks of Liverpool, Antwerp, Bombay, etc., etc. All of these are basins where ships, after passing through locks or gates, can lie, without tidal disturbance, in water of a constant level. The Charles River Basin would be larger than any existing slack-water basin connecting with tide water, either natural or artificial. Or, if we consider it as a navigable river, rather than as a dock, we can turn for comparison to similar work on the Thames, the Seine, Meuse and many other European rivers; or to some of our Western rivers, such as the Kanawha and Monongahela, where our government has spent millions of dollars to improve the navigation by dams and locks. Take the improved navigation of the Seine from Paris to the sea, for instance. Before the building of the present series of eight dams the annual traffic was not over 77,000,000 tons per annum, while in 1881, just after the completion of the dams, it rose to 227,000,000 tons, and in 1888 was 390,000,000 tons. The price of freight per ton, for ascending freight, was from eight to nine francs before the completion of the dams, and is now from four to five francs, or practically one-half the former price, notwithstanding eight lockages. Such facts as these speak much louder than opinions.

Even at the present time the inhabitants of London are clamoring for a dam at Putney, for the purpose of abating the nuisance of flats exposed at low tide between that point and the lowest existing dam at Kew. They have the latter dam before their eyes as an object lesson in river improvement, with the unhealthy and unsightly condition of the river between Kew and Putney in strong contrast.

So, too, when we consider the matter from a sanitary standpoint, precedent is of more value than theory in determining whether or not the slack water with the small amount of sewage which it might contain would be detrimental to health. The dams at Philadelphia, Hamburg Frankfort-on-the-Main, and Paris are existing proofs that the Massachusetts Board of Health was in the right in recommending the dam. At Paris the Seine is dammed just below the city, between the famous Bois de Boulogne on one side, and Suresnes on the other, while that city of two million inhabitants empties three-tenths of its excremental sewage into the river, which has a minimum flow of only 70 cubic feet per capita per diem. And yet Paris is the most attractive city in the world.

But Philadelphia and Hamburg, more closely, in fact almost identically, resemble our own case from the fact that the dams at these places shut out the previous tidal flow.

Years ago a distinguished theorist proved conclusively (to himself and adherents), in an elaborate article, that a steamship could not carry enough coal to cross the Atlantic, but almost before the ink was dry on his paper the first steamship *did* cross. Not only has every innovation, from Noah's ark to the electric telegraph, been hooted at by skeptics, but every community contains people who, ignorant of what has been done elsewhere, oppose the introduction of improvements of proven value. Such obstructionists may theorize about the proposed dam until the end of time, but the existing proof of the value of similar works elsewhere is incontrovertible.

TREATMENT OF THE RIVER BANKS.

By keeping the water at a constant level in the river, the treatment of its shores above Cottage Farm bridge will be simpler and more artistic; grassy banks sloping to the water with overhanging shrubbery will be vastly more attractive than the many miles of granite wall, that would be necessary if the river were left as a tidal stream. and the saving in cost of construction and finish will be enormous.

Below Cottage Farm Bridge a large portion of the shore is already walled, and it is quite probable that the balance will be finished in a similar manner, but by a wall of smaller dimensions which will cost but about thirty-seven per cent. of one like that at the Charles bank.

SCOUR OF THE RIVER.

The diminution of the tidal prism, and the filling in of flats, is considered by the opponents to the scheme as a serious danger to Boston Harbor, and the base of one of their arguments against

the building of the dam. If there is weight in this objection it is surely a spasmodic attempt at virtue at a late day. In the Report of the Surveying Department of Boston of 1893, page 14, it is stated "the commercial problem alone, the great mainstay of a seaport community, has for years been allowed to drift unaided by any fostering action on the part of the municipality, to provide for present needs, and the future growth of a port of the position and prominence of Boston."

In the face of such a statement, the sudden cry about the value of the Charles as to its tidal prism, should be received with ~~the~~ following inquiry as to the motive involved.

The report of the Surveying Department for the same year says:

"The total area reclaimed from the sea up to the year 1894. amounted to 2,245 acres, equal to three and one-half square miles (an amount equivalent to the original land area of Boston, East Boston, and Breed's Island.)"

Again — "No one however, can deny the fact, that all these reclamations of flats and marsh lands, have not only been lucrative investments, but that the ground thus created has been invaluable to the growth and evolution of the whole city into a commercial centre or metropolis." The valuation of the filled land in the Back Bay alone as per the assessors' figures is \$200,000,000.

Notwithstanding all these encroachments, the same report says on page 16, in relation to the Port and Harbor.

"This great inland basin, (several miles long and as many miles wide) is readily accessible at small cost to all trunk lines of railroads entering the city, and has unusual natural approaches from the sea through three deep channels, capable of being rendered navigable at a small cost to the very largest steamships."

This last statement of the Surveying Department, would seem to disapprove any claims that the extensive interference in the past with the tidal prisms, has shown any serious damage to Boston Harbor. Neither does it appear from the testimony submitted at the hearings of the Harbor and Land Commissioners, that any considerable evidence of damaging effects upon the Harbor by past tidal interference has been discovered.

Numerous cases have been cited of successful damming of rivers in European cities, and there is an interesting example in the Fairmount dam at Philadelphia, built seventy-four years ago. This dam crosses the Schuylkill at a point about eight miles above where the river enters the Delaware. At the dam the tide has an average rise and fall of six feet seven inches. The water of the Schuylkill as well as that of the Delaware is full of silt, and the sewage from a large section of Philadelphia, together with the refuse from the gas works and many oil and sugar refineries is daily poured into the river. Notwithstanding this fact, vessels of twenty feet draft can go up to the Walnut street bridge, seven miles above the mouth of the river. Above this point the bridges are drawless, hence all shipping is done by barges and canal boats. The Port Warden of Philadelphia states that forty-five per cent. of the entire shipping of the city goes out of the Schuylkill river.

To ascertain if the building of the dam had caused any shoaling in the river below it, the following inquiry was made at the United States Engineer's office in Philadelphia.

"How often is the Schuylkill below the dam dredged and what is the average volume dredged per annum?" In reply it was stated that there was "some dredging done to deepen channel but none to remove deposits."

In the case of the Charles, should it be found that by building the dam, a certain amount of dredging may be necessary, the total annual expenditure would be but a small percentage of the interest on the saving in expense in shore construction, and the added values to property along the river.

SANITARY EFFECTS.

Under Chapter eighty-five of the Resolves of 1894 the Board of Harbor and Land Commissioners were directed to inquire into the construction of a dam and lock in the tidal basin of Charles river, with special reference to *interference with tide water and its effect upon the harbor of Boston*.

In conformance with the above resolve, the Harbor and Land Commissioners held a series of hearings at the State House, at which eminent legal counsel, employed by certain citizens of

Boston, appeared in opposition to the dam recommended by the joint board. Little evidence was offered that would show that the proposed dam would seriously affect Boston harbor, the remonstrants centering their efforts almost entirely upon the sanitary side of the question, but to the unprejudiced observer the preponderance of the expert and scientific testimony was strongly in support of the dam.

The average layman has confidence in the ability and faith in the recommendations of such eminent authorities as Dr. Henry P. Walcott, the chairman of the State Board of Health, and Hiram F. Mills, the recognized head of the hydraulic engineers of this county, both signers to the report recommending the dam, which report was endorsed by the Massachusetts Association of Boards of Health, by a resolution adopted at their October meeting "approving the plan of damming the Charles River." At the regular meeting of the Cambridge Medical Improvement Society, held November 26, 1894, fifty well-known physicians from Newton, Waltham, Watertown, Brighton, Boston and Cambridge, after a full and free discussion of the question, voted unanimously "that in the opinion of the meeting, the proposed dam would improve the sanitary conditions of the river and the adjacent lands."

That the Schuylkill dam at Philadelphia built seventy-four years ago has produced no unsanitary effects is evidenced by the statement of the Director of the Department of Public Works of Philadelphia in a letter to the Commissioners dated October 5, 1894 in which he says: "The tide in the Schuylkill goes up to the Fairmont dam. I am not aware of any detrimental effect to health on account of the dam"; and by the following letter received from the Board of Health of Philadelphia: —

BOARD OF HEALTH,
CITY OF PHILADELPHIA,
CITY HALL, November 13, 1894. }

Mr. James B. Soper, Clerk Board of Health, City of Cambridge, Mass. :

DEAR SIR: In reply to your question "whether the damming of the Schuylkill river has resulted unfavorably to the sanitary condition of your city," I would reply that it has not. The dams in the river were placed there many years ago, and after changing the bed of the river, the conditions have remained relatively the same as before, while the bed of the river has been raised the condition of the banks to the river is relatively the same as before. Yours truly,

(Signed) WILLIAM H. FORD, *President.*

The proposed change in the Charles River is a radical one, and the questions involved are those which come entirely within the province of engineers and scientists. That such changes are practicable is shown by similar cases in other places. All radical changes, or improvements meet with determined opposition from many well meaning people, who wholly disregard the fact that such changes and improvements have been carefully considered by the most competent experts. The following remonstrance against the present main drainage system is cited by Mr. Eliot C. Clark in his book on the "Main Drainage Works of the City of Boston," page 19, and will prove of interest at this time, as the drainage system has been in successful operation a number of years:—

"The undersigned respectfully remonstrate against the adoption of the system of sewerage proposed in Report No. 3 of this year. We believe if carried into execution it will prove not only ineffectual, but destructive to the health and prosperity of the city. . . . Of late years the cost of many, if not most, of the public works has greatly exceeded the estimates; in some instances, it is said, two or three hundred per cent.

"Should this new system exceed the estimates to a like extent, the amount would be augmented to between fifteen and twenty millions of dollars. . . .

"But we do not believe it (flushing) will, or ever can, be made to perform that end in an effective or satisfactory manner; because we understand, by the report, that the inclinations of the sewer will afford a flow at a minimum rate of only two miles an hour, so that it will be almost impossible to prevent the glutinous slime and putrefactions from constantly gathering and adhering more or less to the sides and bottoms of the sewers and drains, and as constantly exhaling the deadly gases on every side. . . . It will likewise be borne in mind that the thick mass of liquid corruption within the sewers and drains must be drawn along to their uphill or final ascent of thirty feet and over, and kept in motion and delivered at the distant outlets on the bay, by means of enormous pumps and machinery worked by steam engines, or a stoppage in the operations of such an extensive system for only a day or two, along the low lands and other parts of the city, would almost inevitably result in serious maladies and other evil consequences. . . . Will not the exhalation and odor (from the storage reservoirs) blown by every changing wind here and there along the wharves, upon the shipping and back upon the land, create a nuisance so offensive and unhealthful as to become intolerable? No provision seems to be devised to prevent such emanations or their baneful consequences. In

these noisome reservoirs the contents must ever be exposed to the sun, the storms, and the inclemency of the weather.

"In the severity of winter they must become as frozen as the water in the bay or along the shores ; and as often as they are converted into ice there must be an entire stoppage of the works. . . Such reservoirs and outlets might be reduced to ruins in any future day of hostilities—either foreign or domestic—should such hostilities ever occur, the effect of which ruins would be the fatalities of the plague."

A most curious protest from the members of the Bavarian College of Medicine against the building of the first railroad line in Germany is recorded in an English paper. This document declares that, "all the travelling in vehicles drawn by locomotives should be prohibited in the interest of public health." Such a rapid motion, it is pointed out, "cannot fail to produce in the passengers the mental affection known as *delirium furiosum*. Even should the passengers themselves be willing to run this terrible risk, it is, nevertheless, the government's duty to protect the public. To the mere onlooker, moreover, the thing is positively dangerous. A mere glance cast at a locomotive travelling at a very high speed is enough to produce the same mental derangements in the beholder. Even if passengers are to be allowed to ruin their mental powers, it is, at least, absolutely necessary that a 10-foot wall should be built on each side of the line throughout its entire length, so that the flight of the iron horse may in no way unsettle the public eye and mind."

History furnishes many examples of this lack of faith, Stephenson, Fulton, Morse and others have found the skeptic abroad, and that his influence is often for a long time powerful especially when coupled with personal interests, but in the end science, or the interests of the majority usually prevail, and the Commissioners believe that the case of the Charles River basin and dam will prove no exception to this rule.

There is a strong opposition to that part of the report recommending the reduction in the width of the basin, by the filling on the Boston side three hundred feet north of the present sea wall, and in this objection the Commissioners are inclined to share, believing that the basin should be retained as wide as possible, and that no more filling be done back of Beacon street than is necessary to develop an artistic treatment of that section of the river bank.



BOATING ON THE UPPER ALSTER BASIN.

The Charles River has for years been a common sewer, its banks the dumping place for refuse, a place to be shunned and never visited except from necessity. It belongs to the people by the gift of nature, it has been nearly spoiled by man, but is capable of redemption, and in this direction the State Board of Health and the Metropolitan Park Commission are certainly working.

The Commissioners are indebted to Asa M. Mattice, Mechanical Engineer, for the following paper giving results of his extended investigations upon the subject of the Charles River, which paper was furnished them at their earnest request, and is made a part of this report:—

CAMBRIDGEPORT, Mass., Dec. 1, 1894.

Henry D. Yerxa, Esq., Chairman Board of Park Commissioners, Cambridge, Mass.

DEAR SIR: In accordance with your request to furnish you with the data regarding sewage, tidal flow, etc., which I recently used in testimony before the Board of Harbor and Land Commissioners at the hearing relative to the proposed improvement of Charles River, I take pleasure in forwarding the accompanying paper, in which I have taken the liberty to add to my testimony some additional matter relative to the subject, which I hope may be of use to you.

Very respectfully,

ASA M. MATTICE.

The objections to the proposed dam can be briefly stated as follows:—

1. The sewage discharged into the river above the dam will render the basin offensive, if not dangerous.
2. The removal of the tidal flow into and out of the basin will decrease the scour and result in filling up the harbor.
3. Building the dam will remove from the basin the immense mass of cool sea water which now comes into it twice a day.
4. The dam will seriously interfere with the commerce of the river; all vessels having to pass through a lock, and then get into a shallower basin than at present.

Let us consider these objections in the order stated.

DESCRIPTION OF SEWERAGE SYSTEMS.

In order to form a clear view of the questions involved in the first objection it may be well to give a brief description of the sewerage of the borders of the river.

Practically all of the sewers of Boston empty into intercepting sewers which form a part of the "Boston Main Drainage," which was completed in 1885. One intercepting sewer begins at Prince street, and after passing through a number of streets in the West End, it reaches Beacon street at the Public Garden. It then runs through Beacon and Hereford streets and joins the main sewer at Camden street. This sewer serves all that part of the city which formerly drained into the Charles River. A second intercepting sewer runs along Atlantic avenue and Federal street, draining the Eastern and Southern districts of the city proper. Another intercepting sewer takes in the whole of South Boston. Still other sewers intercept the sewage of Dorchester and Roxbury, all emptying into a main sewer which runs to the pumping station at the "Calf Pasture," or Old Harbor Point. Here are located immense pumping engines which pump the sewage through a tunnel, one hundred and forty feet below low tide, to a reservoir on Moon Island. Twice a day, on the ebb of the tide, the gates are opened and the sewage in the reservoir discharged into the waters of the bay.

The connections of the branch sewers to the intercepting sewers are controlled by "regulators," so that the amount of sewage coming from a given branch can be controlled by the depth of water in the intercepting sewer, and any surplus which the main sewer cannot take care of is overflowed into the river or bay. These regulators are, on a large scale, practically the same thing as the ball cocks in the flush tanks which are placed overhead in all modern water closets. The tank represents the intercepting sewer, and the water supply pipe the branch sewer. When you pull the chain the water is lowered in the flush tank (intercepting sewer), and the float automatically opens the outlet of the water pipe (branch sewer). As soon as the water in the tank begins to rise, it gradually chokes off the water supply and finally stops it altogether. These regulators are not, however, attached to all branch sewers. There is one sewer from the Church street district which enters the Beacon street intercepting sewer by a free connection; and several sewers similarly enter the East side intercepting sewer, such as those at Dover street, Union Park street, etc. This was done because the areas drained by these sewers are low land, and their overflow at high tide would cause flooding of cellars.

Each regulator is provided with a means of adjustment, which consists simply of a number of holes in the connection between the float and the valve so that by simply withdrawing a bolt from one hole and putting it into another the regulator can be made to shut off when the water in the intercepting sewer reaches a greater or less depth.

At the "Calf Pasture" pumping station there are at present four large pumping engines. One of these is run constantly, and a second one nearly all the time, to remove the every-day sewage: the daily

pumpage in dry weather being about fifty-five to sixty million gallons per twenty-four hours. The two other pumps are kept in reserve for storm water duty, and when running bring the pumping capacity up to nearly 140 million gallons per twenty-four hours. The pumping station was laid out with a view to doubling the present pumping plant when necessary (see Main Drainage Works of the City of Boston by Eliot C. Clarke, the engineer in charge, 1885, p. 55.)

Emptying into the main sewer of the above described system at Huntington Ave. is the south side Metropolitan sewer. This sewer, which was completed and connected in 1893, runs along near the South bank of the Charles River from near the Waltham line. Into this sewer empty all the sewers of Brookline, Brighton, Newton, Watertown and Waltham; the sewers from those parts of the two last mentioned towns lying on the North bank being taken under the river in inverted siphons. All of the connections with the Metropolitan sewer are controlled by regulators, similar to the sewers of Boston, but all the sewers of Watertown, Waltham and Newton are arranged to carry house sewage and manufacturing wastes only, the storm water being separately provided for, while all new sewers and extensions in Brighton and Brookline, are built on the same principle. Thus, although these sewers are provided with regulators and overflows, they will not themselves tend to produce overflow in time of storm, except as they may receive such amounts of storm water as it is impossible to separate from house sewage.

On the north side of the river a branch of the North Metropolitan system runs through Somerville, Charlestown and Cambridge to near the Watertown line. This will receive the sewage of Charlestown, nearly all of that of Somerville, the greater part of that of Cambridge, and probably eventually a part of that from the east end of Watertown which is not at present sewered. The remainder of Cambridge and a small part of Somerville will be drained by the Alewife Brook branch of the Metropolitan sewerage system, but this part of the sewerage has no connection with the Charles river. The present sewers of Cambridge are on the combined system, like those of Boston, and will overflow house sewage with storm water when overflow takes place. The sewage of Somerville and Charlestown enters the Metropolitan system below the site of the proposed dam, so this part of the sewage does not affect the question. At the Mystic river a pumping station takes the sewage from the Somerville-Charlestown-Cambridge branch and delivers it into the main sewer of the North system, whence it goes to a pumping station on Deer Island which sends it out to sea. The pumping station at the Mystic river is now being equipped with two pumping engines of a combined capacity of about 45,000,000 gallons per twenty-four hours, while a third engine of the same capacity as each of the others is to be added when needed.

SEWAGE POLLUTION.

Having now formed a general idea of the methods of sewage disposal, we can proceed to investigate the matter of the pollution of the river. On the Boston side of the river the amount of the sewage which can be disposed of is at present limited by the capacity of the pumps, which is not much more than half the capacity of the sewers themselves. It is only when there is such an amount of sewage flowing that the pumps cannot handle it all that the sewers fill completely. At other times when the sewage is below the capacity of the pumps, the main sewers are never more than a little over half full. This being the case, it will be seen that no overflow whatever need take place until the pumping engines reach the limit of their capacity, which is at present nearly two and a half times the ordinary dry-weather sewage.

Not only was the Boston Main Drainage laid out with the intention of eventually doubling its present pumping plant, as before cited, but it was intended to supplement the present system of intercepting sewers by another system of high level intercepting sewers which would drain all areas lying higher than Grade 40 (or forty feet above mean low water), whence the sewage would flow by gravitation to the reservoir at Moon Island. (See Eliot Clarke's "Boston Main Drainage," p. 28). Taking the area to be eventually covered by the Boston sewerage system, viz. the area bounded by the Charles and Neponset rivers and the harbor and bay, there are only twelve square miles below Grade 40, and forty six square miles above that level. Only the twelve square miles of low land, plus the areas of Waltham and Watertown on the other side of the river, will have to be drained by pumping. New sewers above Grade 40 are laid out with the intention of connecting them with the high level intercepting sewer when built. (See Report of City Engineer of Newton, 1892, p. 66.)

As to the capacity of the intercepting sewers which have overflow connections into the Charles river; taking the sizes and slopes of the various sewers, I calculate, from well known data as to flow of water, that the capacity of the Beacon street intercepting sewer is something over 28,000,000 gallons per twenty-four hours. The population of the area drained by this sewer, estimated from ward population and the statistics compiled by the Rapid Transit Commission, is approximately 69,000. At the very liberal estimate of 150 gallons of sewage per capita per diem this population would give a sewage of about 10,000,000 gallons per day, or only about 36 per cent of the capacity of the sewer, leaving 64 per cent. to take care of storm water. This district is well built up at the present time, and no very great increase of population can be looked for. Of this population only about 44,000 have overflow connection above the proposed dam, the remainder overflowing below that point.

I calculate from the dimensions and slope of the Metropolitan sewer below its connection with the Brookline system that it has a capacity of about 37,000,000 gallons per twenty-four hours. The population of

Brookline, Brighton, Newton, Watertown and Waltham is about 83,000 from which it will be seen that on the basis of 150 gallons per capita per diem, the sewage from the present population, if all were connected to the sewers, would be only thirty per cent. of the sewer capacity.

I estimate, from information obtained from local authorities, that, at the very outside, the population of Brighton, Brookline and the Stony Brook district which will overflow sewage with storm water does not exceed 24,000, and as sewer extensions in these localities will be on the separate system, these figures will not be greatly exceeded. Adding this to the 44,000 overflow population connected with the Beacon street sewer gives a total of 68,000 on the Boston side of the river.

On the north side of the river the population drained by the Metropolitan sewer along the river is about 151,000, assuming all population connected to sewers. Of this about 72,800 are in Cambridge, and the remainder in Somerville and Charlestown. The remaining population of Cambridge will connect with the Alewife brook system. I calculate the capacity of the Metropolitan sewer at the Mystic river pumping station as about 66,000,000 gallons per twenty-four hours, of which about 45,000,000 gallons can be served by the pumping plant now under contract, and the remainder is to be provided for by future pumps. At one hundred and fifty gallons per capita, the sewage will be less than thirty-five per cent. of the total capacity, or fifty per cent. of the present pumping capacity.

One of the Cambridge sewers joins the Metropolitan system below the site of the proposed dam, and another very large one joins a short distance above, so that a few hundred feet of sewer would place its overflow below the dam. These sewers serve a population of about 41,400, leaving only 31,400 to overflow above the dam. Adding this to the overflow population on the Boston side gives a total present overflow population, supposing all population sewered, of approximately 99,400, or say in round numbers 100,000.

Now, as long as the capacity of the various sewerage systems is *limited by the pumping capacity*, and not by the sizes of the sewers themselves, we have at hand a very simple and effective means of controlling, if found necessary, the overflow of the sewers into the proposed basin. By means of the simple adjustment of the regulators, before mentioned, we can discriminate for or against any given district. For instance, it would be easy to so adjust the regulators that all of South Boston, the Atlantic ave. district, and all the west side below the dam would overflow before the Beacon street district. In fact, the regulators might be disconnected entirely in the latter district, so that overflow could only take place when the Beacon street intercepting sewer would itself be running full. With the water of the basin at Grade 8

it would not be necessary to discriminate in favor of the Church street district, as the flooding of cellars only takes place at high tide, or with water above the proposed level of the basin. In the same way on the other side of the river, the regulators could be adjusted so that Cambridge-below-dam, Somerville and Charlestown would be discriminated against in favor of Cambridge-above-dam. In other words, we could give all the districts above the dam the right of way to the sewage pumps by switching off the surplus storm water of the other districts into the overflow outlets below the dam.

Now, as to how often the sewers are caused to overflow by being crowded with storm water. I find by inquiry that no regular observations are made of the overflows, and I have been informed by officials of the Sewer Department of Boston that they do not know of anybody who can say just what rainfalls will produce overflow at the various outlets with the present adjustment of the regulators. Very little attention is paid to this matter for the very good reason that the overflow, whatever it may be, is not sufficient under present circumstances to do any harm. If any offensive effects should be found at any place, they can quickly be remedied by a change in adjustment of regulators.

The greater the amount of storm water reaching the sewers in a given time, the greater will be the overflow, if any; other things being equal. In order to satisfy myself as to the duration and severity of rains, I have consulted the records of rainfall at Chestnut Hill for the year 1893, prepared under the very careful supervision of Mr. Desmond Fitzgerald, C. E., of the Boston Water Works. The records are obtained by an accurate automatic rain gauge which gives the time of beginning and end of rain to within five minutes. In the following table the dates, inches of rainfall, whether rain or snow, and time of beginning and end, are taken from the Chestnut Hill records. From these data I found the duration of each rain and the rate of rainfall per twenty-four hours, which are shown in the table.

Rainfall, and Pumpage of Storm Sewage, Boston, 1893.

| Date. | Snow or rain. | Time rain began. | Time rain stopped. | Duration hrs. | Rain-fall ins. | Rate of rainfall per 24 hours, ins. | Sewage per 24 hrs., gals. |
|---------|---------------|------------------|--------------------|---------------|----------------|-------------------------------------|---------------------------|
| Jan. 1 | Snow | 9.45 a. m. | ..... } | ..... | ..... | ..... | ..... |
| " 2 | and rain | ..... | 3.00 a. m. } | 17.25 | 1.04 | 1.44 | 90,498,836 |
| " 5 | Snow | 5 00 a. m. | ..... } | ..... | ..... | ..... | ..... |
| " 6 | " | ..... | 5.15 p. m. } | 36.25 | 0.63 | 0.41 | ..... |
| " 9 | " | 1.15 p. m. | 10.00 p. m. } | 8.75 | 0.45 | 1.23 | ..... |
| " 15 | " | 5.00 a. m. | 6.30 p. m. } | 13.50 | 0.10 | 0.18 | ..... |
| " 29 | Rain | 2.00 a. m. | 6.30 p. m. } | 16.50 | 0.43 | 0.62 | ..... |
| Feb. 3 | " | 8.10 a. m. | 3.00 p. m. } | 6.83 | 0.50 | 1.75 | ..... |
| " 6 | Snow | ..... | ..... } | ..... | ..... | ..... | ..... |
| " 7 | and rain | 9.30 a. m. | 5.00 a. m. } | 19.50 | 0.54 | 0.66 | 124,055,074 |
| " 9 | " | 10.30 p. m. | ..... } | ..... | ..... | ..... | ..... |
| " 10 | " | ..... | 3.00 p. m. } | 16.50 | 1.08 | 1.57 | 120,828,830 |
| " 13 | " | 8.30 a. m. | 9 30 p. m. } | 13 00 | 1.44 | 2.66 | ..... |
| " 14 | None | ..... | ..... } | ..... | ..... | ..... | 103,340,430 |
| " 15 | " | 8.30 p. m. | ..... } | ..... | ..... | ..... | 115,695,179 |
| " 17 | Snow | ..... | ..... } | ..... | ..... | ..... | ..... |
| " 18 | " | ..... | 8.00 p. m. } | 23.50 | 1.55 | 1.58 | ..... |
| " 22 | Snow | ..... | ..... } | ..... | ..... | ..... | ..... |
| " 24 | and rain | 12.30 a. m. | 10.30 p. m. } | 22 00 | 2.25 | 2.45 | ..... |
| " 25 | Snow | 2.30 a. m. | 9.30 a. m. } | 7 00 | 0.23 | 0.79 | ..... |
| " 25 | " | 4.45 p. m. | 11.15 p. m. } | 6.50 | 0.28 | 1.03 | ..... |
| " 28 | " | 7.00 p. m. | Midnight. } | 5.00 | 0.22 | 1.05 | ..... |
| March 1 | " | Midnight | 7.15 a. m. } | 7.25 | 0.23 | 0.73 | ..... |
| " 4 | " | 4.00 a. m. | 3.30 p. m. } | 11.50 | 0.20 | 0.41 | ..... |
| " 9 | Rain | 3.00 a. m. | ..... } | ..... | ..... | ..... | 111,382,000 |
| " 10 | " | ..... | 4.45 a. m. } | 25.75 | 1.55 | 1.44 | 134,500,000 |
| " 11 | " | 9.30 p. m. | ..... } | ..... | ..... | ..... | 134,500,000 |
| " 12 | " | ..... | 4.00 p. m. } | 18.50 | 0.30 | 0.39 | 134,500,000 |
| " 13 | None | ..... | ..... } | ..... | ..... | ..... | 134,500,000 |
| " 14 | Rain | ..... | ..... } | ..... | ..... | ..... | ..... |
| " 15 | and snow | 11 00 p. m. | ..... } | ..... | ..... | ..... | 134,500,000 |
| " 16 | " | ..... | 7.50 a. m. } | 8.83 | 1.00 | 2.72 | 132,900,000 |
| " 17 | None | ..... | ..... } | ..... | ..... | ..... | 129,927,000 |
| " 22 | " | ..... | ..... } | ..... | ..... | ..... | 106,000,000 |
| " 23 | Snow | 5.00 p. m. | ..... } | ..... | ..... | ..... | ..... |
| " 23 | " | ..... | 3.00 p. m. } | 22.00 | 0.10 | 0.11 | ..... |
| April 4 | Rain | 8.00 p. m. | 9 00 p. m. } | 1.00 | 0.07 | 1.68 | ..... |
| " 6 | Snow | 1.45 a. m. | 9.30 a. m. } | 7.75 | 0.23 | 0.71 | ..... |
| " 7 | Snow | ..... | ..... } | ..... | ..... | ..... | ..... |
| " 8 | and rain | 1.15 p. m. | 4.30 a. m. } | 15.25 | 0.53 | 0.83 | ..... |
| " 8 | " | ..... | 2.45 p. m. } | 1.83 | 0.18 | 2.36 | ..... |
| " 8 | Rain | 12.55 p. m. | 5.00 p. m. } | 1.00 | 0.10 | 2.40 | ..... |
| " 14 | " | 4.40 p. m. | ..... } | ..... | ..... | ..... | ..... |
| " 15 | " | ..... | 6.30 p. m. } | 25.83 | 0.73 | 0.67 | 105,532,196 |
| " 20 | " | 3.15 p. m. | ..... } | ..... | ..... | ..... | ..... |
| " 21 | " | ..... | 12.30 p. m. } | 21.25 | 1.17 | 1.32 | 102,067,514 |
| " 22 | None | ..... | ..... } | ..... | ..... | ..... | 103,137,000 |
| " 25 | Rain | 7.45 a. m. | 4.00 p. m. } | 8.25 | 0.14 | 0.40 | ..... |
| " 27 | " | 7.15 a. m. | 5.15 p. m. } | 10.00 | 0.17 | 0.40 | ..... |
| May 1 | " | 12.45 a. m. | ..... } | ..... | ..... | ..... | ..... |
| " 2 | " | ..... | ..... } | ..... | ..... | ..... | ..... |
| " 3 | " | ..... | ..... } | ..... | ..... | ..... | 100,700,452 |
| " 4 | " | ..... | 12.15 p. m. } | 83.50 | 3.36 | 0.96 | 130,420,438 |
| " 5 | None | ..... | ..... } | ..... | ..... | ..... | 139,400,000 |
| " 6 | " | ..... | ..... } | ..... | ..... | ..... | 139,400,000 |
| " 7 | " | ..... | ..... } | ..... | ..... | ..... | 115,615,000 |
| " 13 | Rain | 7 50 a. m. | 11.30 p. m. } | 15.66 | 0.50 | 0.76 | ..... |
| " 16 | " | 4 00 p. m. | ..... } | ..... | ..... | ..... | ..... |
| " 17 | " | ..... | 8.00 a. m. } | 16.00 | 1.40 | 2.10 | 104,292,000 |
| " 18 | None | ..... | ..... } | ..... | ..... | ..... | 103,403,332 |
| " 26 | Rain | 6.00 p. m. | 8 30 p. m. } | 2.50 | 0.03 | 0.28 | ..... |
| " 27 | " | 7.50 p. m. | 8.30 p. m. } | 0.66 | 0.48 | 17.45 | ..... |
| June 13 | " | 5.00 p. m. | ..... } | ..... | ..... | ..... | ..... |
| " 14 | " | ..... | 11.30 a. m. } | 18.50 | 0.55 | 0.71 | ..... |

Rainfall, and Pumpage of Storm Sewage, Boston, 1893. — *Concluded.*

| Date. | Snow or rain. | Time rain began. | Time rain stopped. | Duration hrs. | Rain- fall ins. | Rate of rainfall per 24 hours, ins. | Sewage per 24 hrs., gals. |
|---------|------------------|---------------------|-----------------------|------------------|--------------------|--|------------------------------|
| June 17 | Rain | 7.00 a. m. | 7.00 p. m. | 12.00 | 0.24 | 0.48 | ..... |
| " 22 | " | 7.30 a. m. | ..... | ..... | ..... | ..... | ..... |
| " 23 | " | ..... | ..... | ..... | ..... | ..... | 98,471,127 |
| " 24 | " | ..... | 6.00 a. m. | 46.50 | 1.50 | 0.77 | ..... |
| " 24 | " | 9.00 p. m. | 9.30 p. m. | 0.50 | 0.04 | 1.92 | ..... |
| July 5 | " | 9.45 p. m. | 11.30 p. m. | 1.75 | 0.24 | 3.29 | ..... |
| " 8 | " | 8.00 p. m. | 8.30 p. m. | 0.50 | 0.07 | 3.36 | ..... |
| " 12 | " | 4.30 p. m. | 8.30 p. m. | 4.00 | 0.10 | 0.60 | ..... |
| " 18 | " | 7.45 p. m. | 8.30 p. m. | 0.75 | 0.73 | 23.36 | ..... |
| " 22 | " | 6.55 p. m. | 11.15 p. m. | 4.33 | 0.67 | 3.71 | ..... |
| " 23 | " | 2.15 p. m. | 2.55 p. m. | 0.66 | 0.16 | 5.81 | 89,904,707 |
| " 25 | " | 6.30 p. m. | 8.00 p. m. | 1.50 | 0.10 | 1.60 | ..... |
| " 26 | " | 8.00 p. m. | 8.30 p. m. | 0.50 | 0.03 | 1.44 | ..... |
| Aug. 4 | " | 8.00 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 5 | " | ..... | 4.30 p. m. | 20.50 | 1.99 | 2.33 | ..... |
| " 6 | " | 5.40 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 7 | " | ..... | 2.00 a. m. | 8.33 | 1.48 | 4.26 | 114,554,000 |
| " 7 | " | 11.20 a. m. | 11.40 a. m. | 0.33 | 0.03 | 2.18 | ..... |
| " 7 | " | 4.50 p. m. | 6.10 p. m. | 1.33 | 0.33 | 5.95 | ..... |
| " 17 | " | 1.00 p. m. | 6.30 p. m. | 5.50 | 0.09 | 0.39 | ..... |
| " 18 | " | 12.30 p. m. | 3.00 p. m. | 2.50 | 0.04 | 0.38 | ..... |
| " 20 | " | 8.15 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 21 | " | ..... | 2.30 p. m. | 18.25 | 1.84 | 2.42 | 112,438,966 |
| " 24 | " | 6.30 a. m. | 1.00 p. m. | 6.50 | 0.35 | 1.29 | ..... |
| " 29 | " | 6.40 a. m. | 2.30 p. m. | 7.83 | 0.38 | 1.16 | ..... |
| Sept. 1 | " | 8.00 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 2 | " | ..... | 5.30 a. m. | 9.50 | 0.36 | 0.91 | 73,529,871 |
| " 7 | " | 7.50 p. m. | 11.00 p. m. | 3.16 | 0.46 | 3.49 | ..... |
| " 15 | " | 6.30 a. m. | 7.00 a. m. | 0.50 | 0.02 | 0.96 | ..... |
| " 16 | " | 1.00 p. m. | 4.00 p. m. | 3.00 | 0.56 | 4.48 | ..... |
| " 19 | " | 12.05 p. m. | 3.15 p. m. | 3.17 | 0.23 | 1.74 | ..... |
| " 23 | " | 6.30 p. m. | 7.15 p. m. | 0.75 | 0.05 | 1.60 | ..... |
| " 25 | " | 9.30 a. m. | 8.30 p. m. | 11.00 | 0.12 | 0.26 | ..... |
| " 29 | " | 4.15 p. m. | 8.00 p. m. | 3.75 | 0.05 | 0.32 | ..... |
| Oct. 13 | " | 11.00 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 14 | " | ..... | 10.45 a. m. | 21.75 | 1.39 | 1.53 | ..... |
| " 23 | " | 7.00 a. m. | ..... | ..... | ..... | ..... | ..... |
| " 24 | " | ..... | 10.00 a. m. | 27.00 | 2.02 | 1.79 | ..... |
| " 26 | None | ..... | ..... | ..... | ..... | ..... | 102,305,321 |
| " 27 | Rain | 10.00 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 28 | " | ..... | 10.00 a. m. | 12.00 | 0.29 | 0.58 | ..... |
| Nov. 4 | " | 11.30 a. m. | ..... | ..... | ..... | ..... | ..... |
| " 5 | " | ..... | 2.00 a. m. | 14.50 | 0.71 | 1.18 | 69,855,000 |
| " 15 | " | 5.30 a. m. | 3.00 p. m. | 9.50 | 0.19 | 0.48 | ..... |
| " 20 | Snow | 7.00 a. m. | 9.30 a. m. | 2.50 | 0.02 | 0.19 | ..... |
| " 22 | Rain | 12.30 a. m. | 11.00 a. m. | 10.50 | 0.65 | 1.49 | ..... |
| " 28 | " | 2.20 a. m. | 11.30 a. m. | 9.16 | 0.43 | 1.12 | ..... |
| Dec. 1 | " | 7.30 a. m. | 8.00 p. m. | 12.50 | 0.39 | 0.75 | ..... |
| " 3 | Snow | ..... | ..... | ..... | ..... | ..... | ..... |
| " 4 | and rain | 3.00 a. m. | ..... | ..... | ..... | ..... | ..... |
| " 5 | " | ..... | 9.00 a. m. | 30.00 | 1.56 | 1.25 | 101,139,000 |
| " 9 | Snow | 11.15 a. m. | 11.45 p. m. | 12.50 | 0.67 | 1.28 | ..... |
| " 10 | and rain | 2.40 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 14 | " | ..... | 7.15 a. m. | 16.58 | 0.35 | 0.51 | ..... |
| " 15 | Snow | 7.45 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 16 | " | ..... | ..... | ..... | ..... | ..... | ..... |
| " 17 | " | ..... | 2.00 a. m. | 54.25 | 1.54 | 0.68 | 106,759,000 |
| " 19 | Snow | 5.00 a. m. | 8.30 a. m. | 3.30 | 0.03 | 0.22 | ..... |
| " 23 | Rain | 3.30 a. m. | 6.00 a. m. | 2.50 | 0.07 | 0.67 | ..... |
| " 23 | " | 12.30 p. m. | 2.00 p. m. | 1.50 | 0.01 | 0.16 | ..... |
| " 26 | None. | ..... | ..... | ..... | ..... | ..... | 101,497,000 |
| " 29 | Rain. | 11.45 a. m. | 4.30 p. m. | 4.75 | 0.05 | 0.25 | ..... |
| " 30 | Snow. | 1.15 p. m. | ..... | ..... | ..... | ..... | ..... |
| " 31 | " | ..... | 3.00 p. m. | 25.75 | 0.24 | 0.22 | ..... |

It rained on 109 different days, on only eight of which the rain was merely a drizzle, at the rate of less than one-quarter of an inch in twenty-four hours. The total time during which the rainfall exceeded the one-fourth inch rate was about 904 hours or nearly 38 whole days. But the only time when overflow might be expected to do any harm is in the dry months when there is very little water coming down the river to produce change of water in the basin. The flow of the river was least in July, August and September. During these months the total rainfall was equivalent to 4.6 whole days out of a total of 92. Now supposing for the sake of argument, that overflow occurred during every minute of these 4.6 days, and that no sewage at all from the overflow districts above the dam went into the intercepting sewers, but that it all went into the river, let us see what the effect would be.

It is a well-known fact that if sewage be sufficiently diluted it is rendered inoffensive and harmless. Statistics have proven that a water supply of four cubic feet per second per thousand inhabitants will dilute the sewage sufficiently to produce the desired result. To put these figures into a form more easily comprehended, the water necessary for safe dilution is at the rate of 346 cubic feet per capita per diem, or about 2,600 gallons. A case showing both sufficient and insufficient dilution is that of the Blackstone river. At Worcester it formerly received sewage in such quantity that the dilution was only 1.77 cubic feet per second per thousand inhabitants and was very offensive. But at some distance below the city the dilution was increased to 3.88 cubic feet per second, and the river was there not offensive. (Report Mass. State Board of Health, 1890.) This is a case that is cited as a precedent by many writers on the subject. (See for instance Kiersted on Sewage Disposal, 1894, p. 36; Charles C. Brown of St. Louis on River Pollution, in the Journal of Association of Engineering Societies, 1890, etc., etc.) This rate of dilution is so well recognized as safe that the new Chicago Drainage Canal, thirty-six miles long, is being built, on the advice of the Drainage and Water Supply Commissioners, with a view to giving this flow of four cubic feet. (See Kiersted on Sewage Disposal, p. 34.) In fact the flow required by the Act of Congress which authorized the construction of the canal is only 3.33 cubic feet per second per thousand inhabitants. (See London "Engineering," November 9, 1894.) The city of Milwaukee was for a long time troubled with offensive sewage pollution until a pumping plant was established for the purpose of supplying a large quantity of water to the river above the city. This plant can furnish nearly six cubic feet per second per thousand inhabitants, but experiments have shown that four cubic feet are sufficient. (See article by G. H. Benzenberg, City Engineer of Milwaukee, in Trans. Am. Soc. C. E. November 1893.)

The least flow of our river is stated by the Joint Board on the Improvement of Charles River, 1894, to be at the rate of 31 cubic feet per second. I am indebted to the officials at the mill of the Boston Mfg. Co. for the record of the horse power developed by

their turbines at their dam in Waltham during the dry months for the last fifteen years; the average for the driest month (July) for that period being 112 horse power with an average fall of 11 feet. As a horse power is equivalent to the falling of 33,000 pounds through a distance of one foot in one minute, it is easy to find what amount of water would be required to produce this horse power provided that no water were wasted. Assuming the efficiency of the turbines at ninety per cent., the 112 horse power would require a flow of 28,000,000 gallons per day, or at the rate of 41.6 cubic feet per second. (The high efficiency of ninety per cent. is assumed for the sake of being on the safe side, as the higher the efficiency, the less the flow.) But this is by no means all of the flow at this point, for there must be a considerable leakage past this dam, as shown by the fact that in dry weather the level is sometimes rapidly lowered in the mill pond when the wheels are stopped and no water flowing over the dam. These facts show that we will be very safe in accepting as a *minimum* flow the figures given by the Joint Board, and still more safe in using these figures for an *average* dry weather flow.

Now, an average flow of 31 cubic feet per second for three months, or 92 days, amounts to 241,000,000 cubic feet. In the same time, the water required for the dilution of the sewage from 100,000 overflow population for 4.6 days at the rate of four cubic feet per second per thousand population amounts to only 159,000,000 cubic feet; showing that the flow of the river was over fifty per cent. in excess of that required for dilution. This, it should be noted, is based on the smallest observed flow of the river and *on the supposition that all summer rains produce overflow.*

Let us investigate this supposition. It is well-known, from long observations of rainfall and of water collected in storage basins of water works, that water is very slow in appearing in the water courses after a rain, and that only a part of the water falling on a given watershed is finally collected. This varies with the dryness of the season, the nature of the soil, etc., etc. In a city with paved or macadamized streets, and with very little open space, the rainfall appears in the water courses (sewers) sooner than in the country, as might naturally be expected; but still it is surprising how slow the water is in finding its way to its outlets. At the Calf Pasture pumping station a very accurate record is kept of the amount of sewage pumped. I have had the privilege of examining these records for the year 1893, and have added to the above rainfall table the amounts of sewage pumped whenever the daily pumpage amounted to over 100,000,000 gallons per twenty-four hours, at which rate the sewers are not half-full, and there is still about twenty-eight per cent. reserve pumping capacity. In months when the pumpage did not reach the 100,000,000 gallon rate, I have shown the highest days' pumpage. A comparison of the pumpage with the rainfall is very instructive. It will be seen that in the

months of January, June, July, September and November there was not a single rain that brought the pumpage up to 100,000,000 gallons per day. In August there were only two days when this rate was exceeded and even then there was at least eighteen per cent. reserve pumping capacity (the limit being a little over 139,000,000 gallons). There were only two days in the year, May 5th and 6th, when the pumps were driven to their utmost. Supposing, however, that the pumps were not always pushed to their greatest capacity when the sewers were congested, and assuming pumpage at the rate of 130,000,000 gallons or over as the limit, there were only *nine days* in the whole year when the pumps were flooded, and when the excess sewage must, of necessity, have overflowed into the river and harbor. It will be noticed that *it is the long continued rains*, even of moderate force, which make much showing at the pumps, *and short rains make no great impression*. For instance: on the first four days of May it rained steadily for 83.5 hours at the moderate rate of 0.96 inch in twenty-hours. It was not until the third day that the pumpage got up to 100,000,000 gallons. On the fourth day it had reached 130,000,000 gallons; while on May 5 and 6, *after the rain had stopped*, it was up to the limit; and three days after the rain had stopped it was greater than on the third day of the rain. On August 4 and 5 it rained for 20.5 hours, at the rate of 2.33 inches, but the earth was so parched that the pumpage was not greatly affected. This rain, however, got the earth into such condition that a rain of 8.33 hours at the rate of 4.26 inches, on August 6 and 7 brought the pumpage up to 114,554,000 gallons. It might be thought that the reason why short, hard rains do not tax the pumps is that it takes the water too long to reach the pumps after entering the sewers. But the velocity in the Beacon street intercepting sewer when full, or nearly so, is 2.4 feet per second, or 8,640 feet per hour. From Charles street to the pumping station along the line of sewer is 26,475 feet. At the above velocity a particle of sewage would be less than three hours in reaching the pumps. But as the velocity in the main sewer is greater, being as high as 3.8 feet per second in the 10 feet 6 inch sewer leading to the pumping station, the time would really be much less. Therefore, if water reaches the sewers in quantity immediately after falling, then rains of more than three hours' duration ought to have nearly as much effect on the pumps as long rains at the same rate, but a perusal of the record will show that they do not. I took the precaution to ascertain from the repair records whether any pumping engine was laid off for repairs at the time that any hard rain occurred, so that the pumpage record would make a false showing, but found that such was not the case. *There was not a single day in the dry months when there was not a considerable pumping reserve*; in fact, none between May 7 and the end of the year when there was not at least eighteen per cent. reserve. The capacity of the

Beacon street sewer being, as before stated, 28,000,000 gallons per twenty-four hours, there were only two days between May 17 and the end of the year when the whole capacity of the Beacon street sewer could not have been added to the flow without putting the pumps up to their limit. In other words, supposing that the Beacon street sewer regulators were so adjusted that no sewage whatever entered this intercepting sewer, the regulators might have been removed altogether without producing overflow.

The question that concerns us is not whether the sewers *do* overflow, with the present adjustment of regulators, but whether they *need* overflow. Increase of population will not increase the amount of storm water except as new drainage *area* is added. When the pumping plant at the Calf Pasture is completed as intended, it will be very many years before any overflow in the dry months need take place.

1893 was not a dry year, as shown by the rainfall records on the Cochituate watershed for thirty-two years and on the Sudbury and Mystic watersheds for eighteen years. The average of all these records showed 45.98 inches per year, while in 1893 it was 45.90 inches, or almost exactly the same as the average. The wettest year was 1869, with 69.3 inches, and the driest was 1883, with 31.7 inches. A comparison of the rainfall and sewage pumping records for the present year shows even a greater reserve in the dry months than in 1893.

The main conclusion to be drawn from this examination of actual facts is that during the months when trouble might be feared from pollution by sewage not one drop of sewage need enter the river. This being the case, instead of having only fifty per cent. surplus dilution as previously estimated, when I made the assumption that sewage overflowed during all rains, the surplus dilution is infinite. In fact, the flow of the river could be stopped altogether in summer without fear of the water in the basin becoming contaminated.

COMPARISON WITH THE SCHUYLKILL RIVER.

We have in the Schuylkill River at Philadelphia a case closely resembling that of the Charles River as it will be if improved as proposed. The Fairmount dam, which checks the tidal flow at about the center of the city, was built in 1820. The rise and fall of tide at the dam is about six and a half feet. A lock provides for the necessities of commerce. Turbines at the dam drive pumps which furnish a part of the city water supply from the pool just above the dam. Other pumping stations at various points along the above-dam portion of the river supply various localities. At about three-quarters of a mile above the dam is the Spring Garden pumping station which supplies the greater part of the city's drinking water. For about four miles above the dam the river runs through the famous Fairmount Park. Along this part of the river all sewage is intercepted by sewers emptying below the dam, although

storm water is discharged into the river from two large sewers at Laurel Hill. Above the park, in the Manayunk district, seven sewers, four of them five feet in diameter and over, discharge storm water into the river. Beside this, household waste is still carried into the river by surface drainage in this district. (See Annual Message of Mayor of the City of Philadelphia for 1893, p. 67.) Above the city limits, however, there is a great deal of sewage emptied into the river. The best information as to the extent of this was obtained in 1884 when a careful inspection of the entire watershed was made under the direction of Col. Wm. Ludlow, Engineer Corps, U. S. A., who was then in charge of the city water works. Besides domestic drainage, there were a large number of manufacturing establishments discharging their refuse into the river, such as packing houses, gas works, glue factories, soap works, breweries, tanneries, paper mills, etc., etc. (List given in detail in Report of Water Department, Philadelphia, 1884, p. 250, *et seq.*) The drainage area of the river was 1,864 square miles; total population 372,000 above the dam; population having wash water drainage into the river 85,000; and population having water closet drainage into the river 26,900. (Same report, p. 314). The flow of the river is stated in the report of the Bureau of Water for 1893 as follows: "The minimum flow of the river Schuylkill which furnishes ninety-four per cent. of the water supply of the city, is about 200,000,000 gallons per day. The average daily consumption is 180,000,000 gallons per day, closely approaching the available flow of the river when it is not increased by freshets. *During last summer the entire flow of the river was pumped.*" When the flow of the river approaches its minimum, the turbines at Fairmount are stopped, to economize the water supply, and the pumping is all done by steam at the stations higher up the river. From the end of May to the first of November, 1893, water flowed over the dam on only six days. (See chart in Report of Bureau of Water, Philadelphia, 1893). This year the flow was even less, and the turbines were stopped for weeks at a time. Two very valuable sanitary lessons can be learned from the Schuylkill River above the dam. One is that a very large quantity of sewage can be discharged into a river, and yet the drinking water supply for a large city can be drawn from that river, provided that the dilution is sufficient. The Philadelphia drinking water is not up to the standard of Cochituate and Sudbury water, but that it is not a dangerous liquid is shown by the fact that the death rate of Philadelphia is about ten per cent. less than that of Boston. The second lesson is that water containing a considerable portion of sewage can be kept in a basin having no current whatever without becoming offensive. This is proven by the fact that when all the flow of the river is pumped at Spring Garden Station, there is no change whatever in the water of Fairmount Pool in the three-quarters of a mile between Spring Garden station and the dam. This is the most popular part of the park, where people gather by thousands in the summer evenings.

Let us compare the statistics of the Schuylkill with those of the Charles, and let us again assume that sewage overflows into our river

during every minute of the 4.6 days' rain in the three dry months. The sewage from an overflow population of 100,000 for 4.6 days out of 92 would be the same in amount as a constant flow of sewage from a population of $\frac{100,000 \times 4.6}{92} = 5000$.

Now ignoring altogether the 85,000 population having wash water drainage into the Schuylkill, and considering only the 26,900 who have water-closet drainage, the Schuylkill would receive $\frac{26,900}{5000} = 5.4$ times as much sewage as the Charles. But the Schuylkill watershed is 1,864 square miles while that of the Charles is only about 314; the former being nearly six times as much as the latter. Thus we have a river receiving the water from a watershed six times the area of that of the Charles, and emptying into it 5.4 times as much sewage. That is to say, the pollution of the Schuylkill can be taken as $\frac{5.4}{6} =$ say $\frac{9}{10}$ that of the Charles, under the assumptions made, and yet the Schuylkill water is not only not offensive to dwellers along the shores, but is used for *drinking water*. But this comparison, be it remembered, is on the assumption of sewage overflow during all rains in Summer, whereas our pumpage records show that *there need be no overflow at all*. Moreover, the Schuylkill water could receive very much more sewage without being offensive as a basin, although its waters might be dangerous as a beverage. The Schuylkill water at Spring Garden pumping station during the driest part of the season of 1884 contained 0.008 parts of free ammonia per 100,000 parts, and 0.019 parts of albuminoid ammonia. (Report of Water Department, Philadelphia, 1884.) An analysis of the water of the Blackstone River, where not offensive, showed 0.115 parts of free ammonia and 0.043 of albuminoid. (See article on River Pollution in the U. S., by Charles C. Brown, Journal Assoc. of Eng. Societies, Oct. 1890 p. 481.) The latter river thus contained fourteen times as much free ammonia as the Schuylkill and three and one-half times as much albuminoid. Another interesting fact in connection with the Schuylkill is that analysis showed the same amount of both free and albuminoid ammonia in the water at Spring Garden pumping station and at the dam, three-quarters of a mile below, at a time when there was practically no current between these places.

COMPARISON WITH MYSTIC LAKE.

But it is not necessary to go as far as Philadelphia for an example of what can be done. Within an hour's drive of the proposed dam is a similar case, although on a somewhat smaller scale. I refer to the Mystic dam and the fresh water basin of the upper Mystic Lake. This is the source of the water supply of Charlestown, Somerville, Everett, Chelsea, and part of East Boston. The Mystic watershed is small but populous. The area (above the dam) is about 28 square miles, and the population about 23,000, or about 820 to the square mile. The population of the Charles River watershed is about 1,018 to the square mile, or

only 1.22 times as great as that of the Mystic. The Mystic water supply is not, to be sure, as good as could be desired for drinking water; but it is very far from being offensive in any way to the inhabitants of the shores of the lake. In the summer season there is little or no water coming into the lake; and the water-works pumps reduce the level sometimes to below the level of the tide water on the other side of the dam. If we can take care of the sewage of the Mystic valley so as to use the water for drinking, we can certainly keep the water of the Charles sufficiently pure to be inoffensive in the basin, especially as we will have the benefit of the Metropolitan Sewerage System, which is not as yet available for keeping the Mystic supply pure.

FUTURE SEWERAGE.

It must not be imagined that we ought to look ahead and investigate the probable result of a very large increase of population with the present sewerage capacity. Sewers are built with a view to serving the increase of population for only a limited number of years, for the very good reason, among others, that the interest on the capital required to build the sewers of a size much too large for present needs would build still larger sewers when needed. A very good exposition of this fact will be found in the report of the City Engineer of Newton for 1892, page 70, where it is shown that, at four per cent. interest, a dollar saved now in the cost of sewer construction will permit the expenditure of \$3.00 in 23 years, \$4.00 in 33 years, or \$5.00 in 41 years. For an instance of the practical application of this principle, I may mention that the sizes of sewers of the Metropolitan system are calculated to serve the estimated increase of population only up to the year 1930. (See Report of Metropolitan Sewerage Commission, 1893, p. 125.)

It may even be possible that in a great many years from now the flow of the river will be so far decreased, from various causes, that it will be found desirable to construct large intercepting sewers along both sides of the river to collect all possible overflow from the main sewers and discharge it below the dam. If so, the money saved by the dam in decreasing the cost of sea walls, reclamation of marsh lands, supply of fresh water for commercial purposes, renewal of bridges, etc., etc., will much more than pay for such sewers.

Besides, it must not be supposed that in the present state of the science of sewerage we are compelled to rely upon the river or bay as a receptacle for refuse. Modern practice has conclusively proven the contrary. As to various methods of disposal, I may mention the system of intermittent filtration, as used at South Framingham, Marlborough, and Gardner in this state, and in other places; disposal by irrigation, as now used for about one-quarter of the sewage of Paris and for all the sewage of Berlin; also disposal by mechanical separation, chemical precipitation, etc., etc.

In concluding my views on this branch of the subject, I would sug-

gest that even if there *were* defects in our present system of sewerage, they should no more be considered as obstacles to the scheme than the lack of a bridge over a river should be considered an obstacle to the building of a railroad.

DECREASE OF TIDAL SCOUR.

As to the second objection — the effect upon the harbor — I can say but little. I am not sufficiently acquainted with these waters to do more than present a few facts gathered from various sources. In order to be able to definitely predict the effect of cutting off a given portion of the tidal flow, one must be *thoroughly* acquainted with all the minute details of the currents and eddies, the exact conformation and nature of the bottom at all points, the limiting velocities at which the various materials of the bottom are picked up and deposited, or rolled along, etc., etc. He should also know to a nicety the volumes of tidal prism that have been cut off or added in times past and the precise effects which were produced by each addition or subtraction. In fact, I doubt very much if sufficient data exist to enable any one to make a thoroughly scientific prediction, and I believe that the only way in which we can form an idea of the probable effect of a reduction of the tidal flow is to examine, as well as we can, the effects of past reductions so far as the meagre data at hand will allow.

But, in the first place, I would say that I think that a very erroneous impression exists with regard to the amount of the tidal scour. The expression "scour" has been used so much in this connection that many people have formed the idea that the currents of the harbor are very strong. I think that a few facts on this point may prove interesting. The following are the *maximum* currents in Boston harbor at any stage of ebb or flood tide, as given in the current number of the Tide Tables for the Atlantic Coast, U. S. Coast Survey, page 218:—

Between East Boston and South Boston Flats, one-quarter mile E. by S. from Long Wharf, 0.7 knot.

Between Slate Ledge and Bird Island Flats, 1.2 knots.

Off Castle Island, one-eighth mile N. N. E. from N. E. corner of Fort Independence, 1.5 knots.

South of Lower Middle, five-eighths mile E. by S. $\frac{3}{4}$ S. from centre of Fort Independence, 1.1 knots.

President Roads, one and one-quarter mile N. W. by W. $\frac{7}{8}$ W. from Long Island Light, 0.9 knot.

Broad Sound Channel, three-eighths mile N. N. E. $\frac{3}{4}$ E. from Long Island Light, 2.5 knots.

Main Ship Channel, three-sevenths mile N. W. by W. $\frac{1}{2}$ W. from Narrows Light, 1.6 knots.

Nantasket Roads, three-fifths mile S. by W. $\frac{3}{4}$ W. from Narrows Light, 1.2 knots.

South of Brewster Bar, one-half mile W. by S. $\frac{1}{2}$ S. from Boston Light, 0.8 knot.

Between Boston Light and Point Allerton Beacon, one-half mile S. E. from Boston Light, 1.5 knots.

South Channel, one and one-quarter miles N. $\frac{5}{8}$ W. from Narrows Light, 1.8 knots.

In Broad Sound, two and three-quarters miles S. from Egg Rock Light, 0.3 knot.

(For the benefit of those not acquainted with the value of a "knot" I may say that it is a velocity of one nautical mile, or about 1.15 statute miles, per hour).

It will be seen from the above that the swiftest (?) current in the upper harbor is 1.5 knots, off Castle Island, while the greatest current at any place is in the lower harbor, in the deep, narrow channel between Long and Lovell's Island on one hand, and Deer Island on the other, where it is 2.5 knots. As this is the deepest part of the harbor, from 60 to 80 feet at low tide, and as the volume of the Charles-Mystic estuary is only a small fraction of the volume behind this point, I do not think that much trouble need be feared from a reduction of scour here.

While the details of the Boston Main Drainage were under consideration a large number of float experiments were made in order to determine the best location for the outfall sewer. Floats liberated at Moon Island at the beginning of the ebb would travel during one ebb tide to a point between the Brewsters and George's Island, about *four miles* at an *average rate of 0.74 miles per hour*. Floats liberated at Castle Island travelled at about the same rate. (See Eliot Clarke's Boston Main Drainage, p. 23).

The Board of U. S. Commissioners on Boston harbor reported in 1866 as follows:

"The avenue at its narrowest point, between Boston and East Boston, is sufficiently ample to discharge a much larger quantity of water than it now does. . . . The velocities of ebb and flood currents *rarely exceed one mile per hour* in this avenue, so that these drifts could be considerably increased without inconvenience to vessels. To furnish some idea of the velocities of currents in localities much frequented by commerce, the following comparisons are taken from our report on New York harbor:

| LOCALITIES. | Rise and fall of tide. Feet. | Velocity of currents. Miles per hour. | REMARKS. |
|-------------------------------------|------------------------------|---------------------------------------|--------------------------------|
| Between Boston and East Boston..... | 10 | 1.0 | From observations at half ebb. |
| Nantasket Roads..... | 9 $\frac{3}{4}$ | 1.3 | |
| Hudson at New York..... | 4.3 | 2.3 | |
| East river at New York..... | 4.3 | 3.0 | |
| East river at Hell Gate..... | 4.4 | 8.5 | |
| Kill von Kull..... | 4.3 | 2.1 | |

The currents of Boston harbor, it may be seen, are very sluggish, considering the great rise and fall of the tide ; and the very fact that they are so, *indicates the insignificance of the reservoirs above.*"

The italics are my own. The reservoirs referred to are the basins of the Charles and Mystic rivers, as shown by the context. If these basins were insignificant in 1866, they must be still more insignificant today, since large areas have been filled in all along the shores. It has been argued that compensation in kind has been made by taking material from the rivers to fill in the shores, thus retaining nearly the original water volume. This is not, however, a compensation of tidal volume, except where the material removed is above the level of low water, and even then it is only compensation in part unless the water volume gained is similar in vertical location to the volume lost. Dredging material from below low-tide level simply adds to the volume of water that *remains in the basin* at low tide, and does not add to the tidal volume. The United States Commissioners, in the report above mentioned, lay stress upon this very point, as follows, (p. 25) :

"In the case of a tidal reservoir (strictly such) a loss of width cannot be replaced by deepening below the tidal prism ; an encroachment upon the superficial area involves a loss of tide water by which the third advantage mentioned is diminished."

As a matter of fact, the superficial area of the Charles River tidal reservoir *has* been very much decreased, and *had* been at the time the above quoted report was written. The original land and water areas of Boston and vicinity are very clearly shown on the chart by Des Barres, published by Act of Parliament in 1775. A reproduction of this chart is given in the Report of the Surveying Dept., Boston, for 1893. I have located on it the sites of the proposed dam and of the Cottage Farm bridge, and measured the area of the basin included between these points, not including small tributaries such as Muddy River, etc.

I have similarly measured the area between the same points on the Coast Survey chart of 1864 and a map of 1894. The area of the basin as shown by the chart of 1775 was 2.08 sq. miles ; as shown by the chart of 1864 was 1.23 sq. miles ; and by the map of 1894, 0.93 sq. miles. Drawing a line from Battery wharf to East Boston, I have measured the area of the entire estuary up to the Cottage Farm bridge on the Charles, the Middlesex bridge on the Mystic, and the Old bridge on Chelsea Creek, as these are about the limiting points of the broad parts of the basins. The area of this part of the estuary, according to the 1775 chart, was 4.24 square miles, so that the area removed prior to 1864 above the proposed dam, to say nothing of that removed below it, was practically one-fifth of the whole estuary, while the area removed from the same part of the estuary up to the present time amounts to more than one-quarter. In the measurement of 1864, I have considered the mill pond as having been wholly removed from the basin, as it was practically so as far as effect on tidal flow is concerned. The

greatest width of the Charles river basin in 1775 was, from a point at Boston Neck corresponding to near the present corner of Union Park street and Washington street, across to the Cambridge shore, *about one and three-quarters miles*. The broadest part of the basin at the present time is less than three-quarters of a mile wide, where filling is now in progress; while at Harvard bridge the width is only about four-tenths of a mile.

The Board of Commissioners on Boston Harbor, in 1866, predicted dire calamity as the effect of the Charles river bridges. They wrote:

"For effective scour, it is all-important that the harbor streams should be reinforced at the right moment by the ebb of the interior basins. The conditions which were satisfied once, when these channels were formed, are not satisfied now, because (we speak with authority) the volumes of water are added to the outflow too late in some cases. It will be found on examining our data that we, so far from having magnified the effects of these bridges, have cautiously refrained from strong expressions regarding them, preferring to let the figures speak for themselves to every intelligent mind. In the Charles river, in the distance of about half a mile, there are over *eleven thousand piles* driven into the bed of the stream beyond the pier lines, simply to support eight bridges." (The italics are the Board's) "We suggest that as these bridges are repaired, their piers should be set in the line of current, and that they should be sheathed and so built as to present sharpened prows to the drift or stream from above or below," etc., etc.

That was written twenty-eight years ago. The eleven thousand piles are still with us—and so is Boston harbor.

The Board said further:

"The upper harbor of Boston, because of the local value of its main channel and because of the indirect value of its tidal volume to adjacent portions of the lower harbor channels, *cannot*, in our opinion, *afford to lose another cubic yard of tide water*," etc.

(The italics are the Board's) Since then *several* cubic yards of tide water *have* been lost by filling in—in fact nearly a third of a square mile of superficial area,—but no awful calamity seems to have resulted to the harbor. The Board of Commissioners, however, took the precaution to "hedge" somewhat, in the following words (Report of 1866, p. 60):

"In the few pages immediately preceding, we have laid down general principles, and illustrated them by striking examples, in which the relation of cause and effect is simple, direct and obvious, reserving the application of them to our subject, because, in Boston harbor, we discover *traces* of many causes, rather than *well-defined effects*." (The italics are the Board's).

But suppose that well defined effects *had* followed the causes of which they found traces, and that the harbor *had* shoaled to a marked extent. It is simply a matter of business policy whether it would be

better to remove the causes, or to retain them and maintain the depth of harbor artificially by dredging. Suppose that the lands reclaimed from the tidal estuary were made to bear the expense of any damage they might cause in the way of shoaling. The Back Bay lands alone, which were reclaimed from the Charles river, were assessed in 1892 for \$146,480,500. (Report of Surveying Dept., Boston, 1893, p. 29.) Suppose them to be taxed only one tenth of one per cent. of their assessed value for the purpose suggested. This district alone could well afford to pay the sum of \$146,000 per annum rather than provide compensation in kind for the tidal volume lost by their reclamation, and this \$146,000 would pay for the dredging out of a large mass of "well-defined effects."

Let us see, however, as well as the data at hand will permit, how much the harbor has shoaled. I have plotted on the Des Barres chart of 1775 the course laid down for vessels in the main ship channel on the Coast Survey chart of Boston Harbor, No. 337, and continued the course up to off Battery wharf. Then, beginning at a point abreast of Long Island Light I have laid off quarter-mile distances, coming into the harbor, and have noted in the following table the soundings shown at these various stations. I have also noted the soundings at corresponding stations on the Coast Survey chart, these soundings having been made in 1861-1864. The U. S. Engineers made, in 1888, a very complete chart of the upper harbor, down to Castle Island, giving numerous soundings and showing where dredging had been done. I have noted in the table the soundings given on this chart at the stations corresponding to those on the chart of 1775. It was formerly customary to refer all soundings to extreme low water instead of to mean low water, as at the present time. The lowest observed tide in Boston Harbor was 2.5 feet below mean low water. (See Coast Survey chart No. 337). I have, therefore, added 2.5 feet to all soundings on the 1775 chart, thus reducing them to the same plane of reference as the soundings of 1864 and 1888. Where soundings were not given exactly at the quarter-mile stations, but close by, I have given the two nearest soundings. Where soundings were not given on the 1775 chart I have omitted the Coast Survey soundings.

It will be seen from this table that the average depth of water in the middle of the Main Ship Channel in 1775 was 28.17 feet, and in 1864 was 28.47 feet. By comparing the various soundings it will be seen that there are some individual discrepancies, as might be expected where soundings are not taken in exactly the same spots; but the average ought to be pretty correct, and shows that *the depth of water was practically the same in 1864 as it was 89 years earlier*, notwithstanding the reduction of tidal volume.

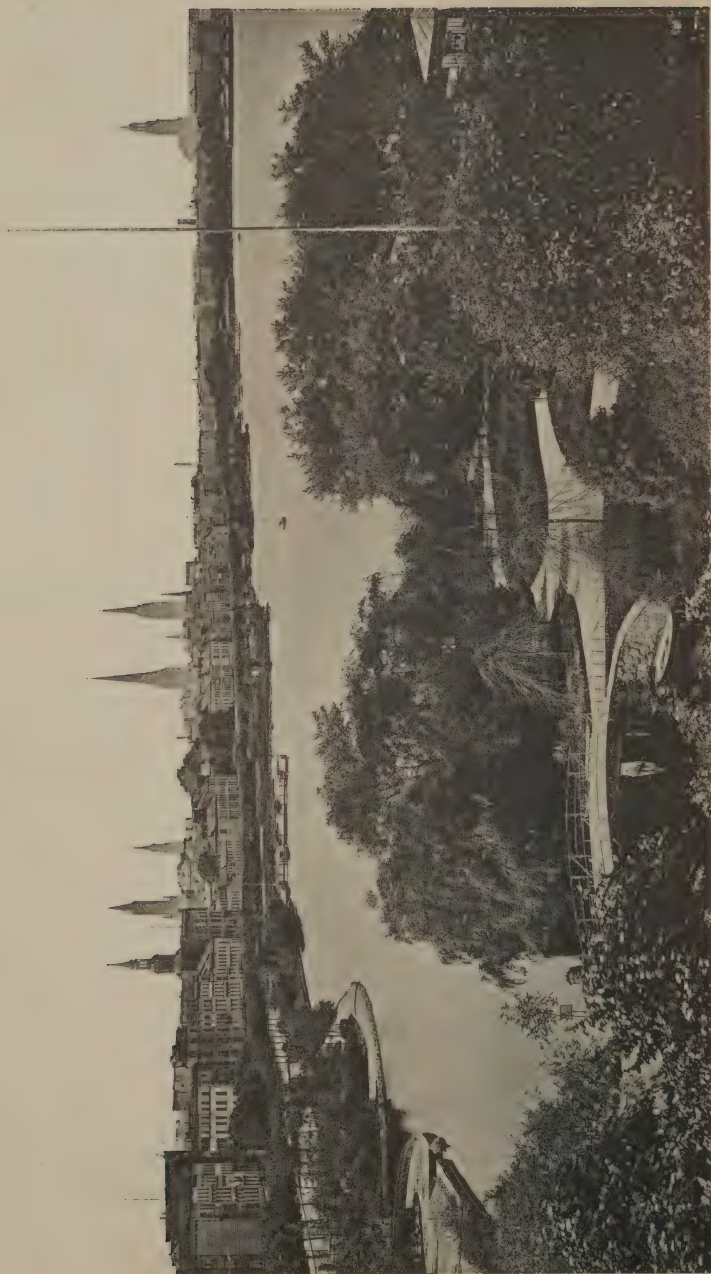
Soundings in Main Ship Channel.

| No. of station. | Location. | Course. | SOUNDINGS, IN FEET. | | |
|-------------------------------|---|---------------------------|----------------------------|---------------------------|------------------------|
| | | | Des Barres' Chart of 1775. | U. S. Coast Survey, 1864. | U. S. Engineers, 1888. |
| 1 | Between Long and Deer Islands | W. $\frac{3}{4}$ N. | 38.5 to 56.5 | 26 to 58.5 | |
| 2 and 3 | Soundings not given on 1775 chart..... | ..... | ..... | ..... |  |
| 4 | In President Roads, $\frac{3}{4}$ mile from No. 1..... | W. $\frac{3}{4}$ N. | 38.5 | 30 to 52 | |
| 5 to 7 | President Roads. No 1775 soundings given..... | ..... | ..... | ..... |  |
| 8 | S. of Lower Middle; $\frac{1}{2}$ mile N. of Spectacle Island..... | W. $\frac{3}{4}$ N. | 26.5 | 24 to 53 | |
| 9 | S. of Lower Middle; $\frac{1}{4}$ mile from No. 8..... | N. W. $\frac{1}{2}$ N. | 26.5 | 25.5 | |
| 10 | $\frac{1}{4}$ mile from No. 9..... | " | 23.5 to 29.5 | 24 to 36 | |
| 11 | Off Lower Middle, about $\frac{1}{2}$ mile E. of Castle Island..... | " | 23.5 | 16 to 22.5 | |
| 12 | Off Lower Middle, about $\frac{1}{4}$ mile N. E. of Castle Island..... | " | 26.5 | 25.5 | *24 to 25.8 |
| 13 | Between Castle and Governor's Islands, $\frac{1}{4}$ mile from No. 12..... | " | 26.5 | 27 | 26 |
| 14 | Upper Middle, $\frac{1}{4}$ mile from No. 13..... | N. W. $\frac{3}{4}$ N. | 20.5 to 32.5 | 22.5 to 27 | *23.5 to 25.9 |
| 15 | Upper Middle, about $\frac{3}{8}$ mile from Governor's Island towards South Boston..... | " | 20.5 | 21 to 22.5 | 21 to *25.1 |
| 16 | Upper Middle, $\frac{1}{4}$ mile from No. 15..... | N. W. by W. | 20.5 to 26.5 | 22.5 | 22.5 to *23.9 |
| 17 | Between Slate Ledge and west end of Governor's Island..... | " | 32.5 | 28. | 30 |
| 18 | No soundings on 1775 Chart..... | ..... | ..... | ..... | ..... |
| 19 | Anchorage Shoal, about $\frac{1}{4}$ mile north of Slate Ledge..... | N. W. by W. | 23.5 | 22.5 | *23.5 |
| 20 | About 2300 ft. N. by W. of Slate Ledge and $\frac{1}{2}$ mile from Central Wharf... | N. by W. $\frac{1}{2}$ W. | 22 | 27 | 27 |
| 21 | $\frac{1}{2}$ mile from No. 20..... | " | 20.5 to 26.5 | 25.5 | 27 |
| 22 | Between Long Wharf and Cunard Wharf.... | " | 23.5 to 32.5 | 28.5 to 31.5 | 28.5 to 38 |
| 23 | Near the course of South Ferry..... | " | 32.5 | 30 to 43.5 | 30 to 43 |
| 24 | Between Battery Wharf and East Boston..... | " | 32.5 | 22.5 to 36 | *24.3 to 38 |
| Average of all. | | | 28.17 | 28.47 | |
| Average of Nos. 12 to 24..... | | | 26.50 | 26.75 | 27.52 |

*Soundings taken where dredging has been done.

No more interesting or valuable information as to the harbor can be obtained than from the people who have done the dredging. I have made inquiries of the various dredging companies, as well as of parties formerly in the business. Mr. James Wooley of Boston, Agent of the Commercial Tow Boat Company, who was in the dredging business back in the sixties, and whose father before him dredged the harbor back as far as 1835, informs me that no dredging whatever was done in the Main Ship Channel prior to 1862. The first dredging done there was to take off the edge of Lower Middle shoal so as to widen the channel. As the soundings given in the preceding table were taken in mid-channel this dredging would not affect them, so that it is evident that the depth of the channel had not been kept constant by artificial means.

The U. S. Engineers' chart of 1888 shows that at various places dredging had been done to give a depth of 23 feet at mean low water. The places dredged below Charles river bridge are as follows:—Man-of-War and Junction shoals, at the junction of the Charles and Mystic; Anchorage shoal, about half a mile below Long Wharf; Fort Point Bar, at the mouth of Fort Point Channel, and Upper and Lower Middle shoals. These are the only places dredged in the upper harbor except along the pierlines. In the lower harbor dredging has principally been done in the narrows between Lovell's, Gallup's and George's Islands, on Centurion shoal, and off Boston Light. My inquiries among the dredging people met with the same answer everywhere: that in the upper harbor *practically nothing but clay, or clay mixed with stones*, has been dredged from the channel. Around the piers more or less city refuse is dredged, but as soon as that is removed they get into clay. In some places, as at Man-of-War shoal for instance, large boulders had to be removed. The dredging has been done to deepen the ancient channel; not to remove deposits. In some places the clay is covered by a few inches of mud or sand, while in other places it is bare and clean. Mr. Charles H. Souther, President of the New England Dredging Co., who has been in the business for about twenty-five years, is positive that the stiff clay which forms the shoals has been there for ages and could not possibly be acted upon by the feeble currents of the harbor. An examination of samples taken from various parts of the harbor confirms this opinion. About the only place in the navigable harbor where there are evidences of a marked deposit by tidal action is in the lower harbor near George's Island, where the strongest currents are found, and where a deposit of sand and gravel has been removed. The above remarks do not refer to the Charles river basin, as it is well known that alluvial deposits have taken place there, but all the material brought down the river seems to be deposited there and not in the harbor. In the preceding table, in addition to the average depth at all of the quarter-mile stations in 1775 and 1864, I have shown the average for stations Nos. 12 to 24 in order to compare them with the depths shown by the U. S.



UPPER ALSTER BASIN, LOOKING TOWARD THE CITY.

Engineers' survey of 1888. It will be seen that the depth which had remained constant for 89 years has since 1864 been increased about 9 inches by dredging.

I would ask any fair-minded man if the combined evidence of the charts and the dredging men as to actual facts is not of infinitely more value than any amount of speculation as to what *ought* to take place in order to satisfy the opinions of theorists.

LOSS OF THE COOL TIDAL FLOW.

We come now to the third objection,—the removal of the cooling body of tidal salt water. There seems to be a popular idea that when water goes out on the ebb tide, it somehow disappears, and that on the flood tide quite another volume of cool salt water, fresh from the depths of the sea, comes into the estuary, with a consequent cooling and beneficial effect. A little reflection on the subject will show that this can be true only in very small part, and that the great bulk of the tidal water is the same water travelling back and forth, into and out of the harbor.

If the water which comes into an estuary were really salt water, rushing along without affecting the water which remained in the estuary at low tide, then we would find salt water as far up, or nearly as far, as tide water extends. But it is well known that rivers, even those which have a very small fresh water flow, are fresh for a long distance below the upper limit of tide water. The fact is, that the water does not come into an estuary in successive layers, each covering the preceding, like water flowing over a floor, but the rise in level is general and gradual, each particle of water pushing the particle ahead of it. At the very head of the estuary, supposing no flow of upland water, a particle of water does not travel any appreciable distance horizontally, but simply rises and falls. A little lower down, a particle will have a slight movement down stream as the tide falls, and a corresponding movement up stream as the tide rises. The further down stream we go, the greater we find the horizontal range of any given particle. If there is a flow of upland water down the stream, then each particle travels a little farther on the ebb tide than on the flood, as it is kept from returning quite as far by its place being occupied by fresh river water. If there were no diffusion whatever of the water—if a body of water could exist without mingling at all with another contiguous body which is not separated from it by some sort of partition—and if no upland water entered an estuary, then any given particle would forever ebb and flow in exactly the same path. And if we still assume no diffusion, but assume a flow of upland water, then each particle will travel in exactly the same path, except as it is pushed down by the upland water, and we would find perfectly fresh water in all tidal rivers down to their very mouths. This state of things is only found, however, in a very few of the largest rivers, where the flow of upland water much exceeds the amount of diffusion. For diffusion does take place, although to no very great extent. If we start at the head of tide water in a river, where the water is always fresh, and

travel down stream, we will come to a point where we will find fresh water at low tide and brackish water at high tide. Lower down we will find a place where the water is quite salt at high tide, but just shows a slight brackishness at low tide; and so on. As examples, I may mention that the city of Poughkeepsie draws its drinking water from the tidal waters of the Hudson, getting fresh water at all stages of the tide. At Rotterdam, Holland, the river Maas is brackish at high tide, but at low tide it is perfectly fresh, and they draw it into a basin to be pumped by the water-works, until the next low tide will permit them to open the gates, and admit a new supply.

A very interesting experiment was made some years ago by an English engineer, Mr. Charles Foote Gower, C. E., to investigate the horizontal range of any given part of a tidal body. (Proceedings of the Institution of Civil Engineers, vol. lxxxvi., 1885-6, p. 253). He constructed a tank which represented, to a given scale, the estuary of the Orwell. In this he produced tides by admitting or withdrawing water from the end of the tank which represented the sea. He used colored water to represent the water in the estuary at low tide, and uncolored water to represent the sea. In this way he could watch the mixing of the waters where they met, and found that, in this particular case, at the twenty-fifth tide the mixing had gone on to such extent that the estuary water could hardly be distinguished from the sea water, so that there had been *a change of only about four per cent. of tidal water at each tide.*

It might be thought that this case was too artificial in its nature to show what takes place in an actual estuary, with various disturbing causes. In order to form some sort of an idea of what actually goes on in the Charles River Basin, I had five bottles of water taken from the river at the Harvard Bridge, one day in November of this year. These samples were taken at just before high tide, when there was a barely perceptible current up stream. One sample was taken at the middle of the bridge, one at each shore, and the two others at intermediate points. I made a mixture of equal parts of these samples, which ought to be a fair average sample of the water at that point at high tide. The specific gravity of the mixed sample at 60° F. was 1.018, while the specific gravity of normal sea water at the same temperature is 1.028. This showed that the river contained at that point $\frac{1}{8}$ or sixty-four per cent. of salt water and thirty-six per cent. of fresh. Another sample from the river, taken also at high tide, from near the middle of Craigie's Bridge, showed a specific gravity of 1.021, showing that at that point, where the water would be saltier than at any point above, there was only seventy-five per cent. of salt water present. At the other extreme of the estuary—at the Watertown dam—the water is fresh at all stages of the tide. As the Harvard Bridge divides the river, above the proposed dam, into two very nearly equal parts, volumetrically, the density of the water there ought to show a fair average of the water in the basin. Considering that the water at Craigie's Bridge was only

seventy-five per cent. salt, we would be a long way on the safe side if we assume that the sixty-four per cent. at the Harvard Bridge was an average of the entire volume of water. I was not able to get any exact data as to the flow of the river at that time, but it was, evidently, under the yearly average. The average flow would replace the basin water every 15 days, as determined by the investigations of the Joint Board on the Improvement of the River. Assuming that the flow was up to the average, then the density of the water showed that there was thirty-six per cent. of fifteen days' flow, or 5.4 days' fresh water in the basin, which is practically the amount of water which would arrive in the basin from above in about 10.5 complete tides, showing that *the fresh water which had entered the basin during the nine and one-half previous tides, had come back into the basin after each ebb tide had taken it out.* But the waters of the Charles mingle with those of the Mystic and Chelsea Creek in the channel between Boston and East Boston; and as there had been no water flowing over the Mystic dam for many weeks before I tested the density, very little fresh water was coming from that direction, but fresh water from the Charles was going into that part of the estuary at every flood tide. There was, therefore, in the entire estuary at that time much more fresh water from the Charles River flow than was shown by the density of the water in the Charles itself. As the volumes of the two parts of the estuary are practically equal (see Report of Board of Commissioners on Boston Harbor, 1866, p. 70), we will probably not be far out of the way, if we say that the fresh water in the whole estuary was the water which had come down the Charles River during at least the previous 18 tides, and had gone out of the basin and come back again that number of times. As previously stated, the average velocity of tide shown by the Moon Island float experiment, was about three-quarters of a mile an hour. As the *maximum* current between Boston and East Boston is not much over one mile an hour, we will be safe in assuming that the *mean* velocity of the tidal flow of the Charles is no greater than three-quarters of a mile, and it is probably much less. This would take a particle of water about four miles during a six-hour tide. Laying off on a chart four miles from Harvard Bridge brings us down to the lower end of Bird Island Flats, or about a mile above Castle Island. It is impossible that a particle of water which reaches Harvard Bridge at high tide should have come from below this point, and it would probably not come nearly as far. This is corroborated by the report of the Board of Commissioners on Boston Harbor, 1866, p. 56, where they say:—

“The ebb of the Charles and Mystic rivers conjoined, actually meets the flood coming up *through the Castle Island Narrows* after low water is past.”

If the tide from the mouth of the Charles gets only as far as Castle Island, the water from Harvard Bridge cannot get nearly so far down before it is checked and brought back.

Investigation of the tidal flow of the Thames in 1884, by the Royal Commission on Metropolitan Sewage Discharge, showed that London sewage which was discharged into the river at Barking Creek, below the city, remained in the tidal prism, ebbing and flowing, *for twelve days during heavy floods, and for thirty-three days during dry weather flow.* (Kiersted on Sewage Disposal, p. 41.) In their report the Commissioners gave the following as one of the results of their observations: —

“That the sewage discharged from the main outfalls becomes very widely distributed by the motion of the water, *both up and down the river, being traced in dry weather through the metropolis and almost as high as Teddington; and that it oscillates for a long period before getting finally out to sea.*” (Crimp, on Sewage Disposal Works, 1894, p. 27.)

All the available evidence goes to show that the water of the Charles River simply goes out a short distance on the ebb tide, mingling with the waters of Miller's River, the Mystic, and Chelsea Creek; picking up the refuse from slaughter houses, and the sewage from East Cambridge, Somerville, Chelsea and East Boston. Then it basks for a while on the East Boston flats and lurks around the pile wharfs and in the ferry slips. Finally, as the flood tide begins, it loses a part of its foul self by diffusion, and, taking along with it a barely perceptible amount of unde-filed matter so as to give itself an air of semi-respectability (after the manner of Tammany) it comes back into the basin and is introduced to us by its loving friends as “cool salt water.” And, when, after a few hours, it goes out again to pick up some more sewage to bring back, leaving the sea walls and flats exposed, and the wind wafts the smell of putrifying vegetable and animal matters from these exposed surfaces to our nostrils, the friends of this sweet tide water present the stench laden atmosphere to us as “salt sea air.”

With fresh water kept in the basin by a dam, the residents along the shores can make the water what they will. They can empty all their sewage into it, or they can keep it pure and clean, according to their liking, but, however, they may treat it, it is only the filth from their own door yards which need get into it, and not the refuse of the whole populous community between the dam and Castle Island.

EFFECT ON COMMERCE.

The fourth objection to the dam — its effect upon commerce—appears to be divided into two parts; first, that there will be insufficient depth of water above the dam; and second, that the passing through a lock will be, directly or indirectly, a source of expense to shippers.

As to the depth of water: there seems to be an idea held by some people that because the proposed level of the water in the basin is Grade 8 (or 2.5 feet below what is ordinarily known as high tide), the depth of water will be decreased that much. It should be remembered, however, that ordinary neap tides reach only to about Grade 9.3, so that the proposed water level will be only about sixteen inches below high water at every neap tide. A very cursory examination of the amount of land to be filled in for park purposes all along the river will show that the amount of filling will require much more material than will be given by dredging out the channel of the river to the amount of sixteen inches; and there is no way in which filling can be done so cheaply as by taking material from the river bed. Thus, incidentally, the depth of water will be as great as it is now for a great part of the high tides.

As to the disadvantage (?) of passing through the lock, a great deal of theorizing might be done on both sides. But, putting all speculation aside, a great deal can be learned on this point by comparing the proposed basin with the foreign docks. For a great many years it has been the policy of seaports in England, France, Belgium and other European countries to build great basins, or harbors, where the water is kept at a constant level, and ships admitted only at high tide through gates, or else at all stages of the tide through locks. The very fact that vessel owners send their craft into these basins or docks voluntarily, and pay for the privilege too, rather than put them alongside wharfs in the tidal streams, shows that long-headed business men have found the non-tidal basins of advantage, notwithstanding the locks.

A good idea of the extent of some of these foreign docks can be formed when it is said that the sizes of the various London docks (non-tidal) vary from 10 acres for the St. Catherine docks to 173 acres for the Victoria docks. The total acreage of all the London basins together, great and small, is 465, built at an expense of hundreds of millions of dollars; while we have right at hand a basin of 758 acres (after filling in the shores) which we propose to make non-tidal by the simple building of an inexpensive dam, thus giving us a basin sixty per cent. larger than all the London docks together. The latest of the London docks, the Tilbury, completed in 1886, has an area of 70 acres, or less than one-tenth of our proposed basin. The construction of this one dock involved the excavation of 3,275,000 cubic yards; the use of six steam excavators, five dredges, fifty-four locomotives, thirty-five portable engines, and forty-six pumping engines; and the employment of an average of 4500 hundred men for eighteen months. (See *Scientific American Supplement*, May 29, 1886, p. 8663.) And all of this expense was incurred in order that vessels might pass from tide water through a lock 80 x 700 feet, into a little basin where, as in the proposed Charles River basin, it is *high tide all the time*.

The advantages to commerce of the constant water level—the lack of appreciable currents, ease of moving vessels about, facility of handling cargo, etc., etc.,—can be fully appreciated only by those who are

directly interested in shipping. Some features of the question can, however, be easily understood by the non-commercial world. Let us suppose, for instance, that we are unloading a vessel in a tidal estuary, and that the rise and fall of the tide is about ten feet, as in the Charles River. Suppose that we have a cargo which will have to be handled in one thousand separate parcels. Suppose we have to unload at low tide, or with the vessel lying ten feet lower than at high tide. At each hoist the load must be hoisted ten feet farther than at high tide, and the empty rope must descend ten feet farther for the next load, and the time of everybody connected with the hoisting, the time of the wharf, and the time of vessel are all wasted during the periods required for the extra height of hoist. When taken in detail this may not seem like an appreciable waste, but if we add together the time lost in the 1000 hoists, we will see that it amounts to the time required to hoist to a height of 10,000 feet, and to lower the same distance. But unloading would not all be done at low tide, so that the useless hoisting would average only that due to half tide, or in our case about five feet. The useless hoisting and lowering of our 1000 parcels would each amount to 5000 feet, or nearly a mile. Now let us suppose all the unnecessary hoisting concentrated into one long hoist, and we can imagine all hands sitting down for a smoke and a perusal of the morning paper while we hoist our load a mile up into the air, and lower our empty hook the same distance. Anybody who will take the trouble to go to some coal wharf and note the rate of hoisting, calculate what the lost time would amount to for the extra hoisting due to low tide, find the money value of the loss for the entire cargo and, from these data find what money is lost per annum in the harbor from this one item alone, will easily see how it is that our foreign friends have found that non-tidal basins pay big returns on their investment. This aspect of the case is simply the well-known one that goods are handled more cheaply in bulk than in detail. It is cheaper to handle the whole cargo, ship and all, in a lock, than it is to hoist the cargo piecemeal the same height. When years of experience have proven that it pays to build expensive non-tidal basins for the purposes of commerce, I cannot see how any good argument can possibly be advanced to show that in any way a similar basin when produced for sanitary reasons can be any detriment to commerce. In fact, commerce should be thankful that it is getting an expensive benefit at no cost to itself.

COST OF DAM.

The cautious taxpayer will probably ask how much this dam is going to cost, to which query the reply can truthfully be made that it will cost considerably less than nothing. Whether the dam be built or not, the proposed improvement of the river will require extensive treatment of the banks. The tidal estuary above the proposed dam is 8.5 miles long, up to the lower dam at Watertown, making about 17 miles of banks. In all this distance the only sea wall at the present time is about 1,500 feet

at the Charlesbank, and about 4,000 feet at the new improvements on the Cambridge side; say a little over a mile. The present embankment on the Boston side above the Charlesbank is not here considered, as the proposed parkway will require a new wall further out in the river. There is but one way to properly treat the banks of a tidal stream so that they will be least offensive to sight and smell at low tide, and that is to build vertical stone walls extending down to low water level. The admirable granite wall at Charlesbank is a good example of what would have to be built, eventually, on both sides of the entire length of tidal river. But with water kept at a constant level by a dam, a very much less costly wall would serve the same purpose, as only a few feet of height of stone work would be needed. The foundation for the wall in either case would be of piles, the same as at the Charlesbank, only in one case the piles would end at or near low water, and in the other would come to within a few feet of the still-water level; and piling is much cheaper than masonry.

The bottom of the Charlesbank wall is at Grade 1.92, and the coping at Grade 15, making a height of 13.08 feet. The width of wall at the bottom is 7.67 feet, and at top 4.6 feet. (See Report of the City Engineer, Boston, for 1886, p. 31). This makes the cross section of masonry a trifle over 80 square feet. But a wall of less height does not have to be as thick in order to act as a retaining wall for the earth behind it. A very good example of the sort of wall that would answer all purposes with water at a constant level is the granite wall along the Schuylkill river in Fairmont park, Philadelphia, where the water level is practically constant. The total height of masonry is 6 feet. The width at bottom is 4 feet and at top 3 feet. (See Engineering Record, Sept. 1, 1894, p. 221.) The cross section of masonry is only 21 square feet, or a little over 26 per cent. of the cross section of the Charlesbank wall. It will be easily seen that a difference like this in construction will amount to a big difference in cost in 15 or 16 miles of wall.

But, if the dam be not built, the desired sanitary effect will make it necessary to not only build the more expensive sea wall, but to dredge out the flats so that they will not be exposed at low tide, and to fill in the marshes which are now overflowed at high tide, but which would be dry with water at Grade 8. The Joint Board on the Improvement of the Charles River estimated the cost of the various items as follows: Cost of dam and lock, \$660,000; walling the total length of tidal basin and river \$3,800,000; walling the same as a non-tidal basin, \$905,000, or walling the non-tidal basin only as far as Cottage Farm, \$475,000; dredging the flats, \$500,000; filling the marshes, \$1,000,000. Leaving the last item out of the question altogether, because more or less filling would be done, even with water at Grade 8, the account would stand about as follows:

Tidal basin :

| | |
|-------------------------|-------------------|
| Sea wall. | \$3,800,000 |
| Dredging flats. | 500,000 |
| | <hr/> \$4,300,000 |

Non-tidal basin :

| | |
|-------------------|-------------------|
| Sea wall. | \$905,000 |
| Dam | 660,000 |
| | <hr/> \$1,565,000 |

| | |
|---|-------------|
| Difference in favor of the dam. | \$2,735,000 |
|---|-------------|

or about 400 per cent. of the cost of the dam.

Considered as an investment, this may be said to be, as investments go, a *very fair profit*. But it is not even necessary to use a wall at all for the non-tidal river. A gravel bank would answer the purpose just as well and would cost very little, and the landscape architects of the park systems would probably prefer this treatment for a large part of the banks. Let us call the saving by the dam an even two and a half million dollars. The interest on this at 4 per cent. would be \$100,000 per annum. Let us suppose this sum to be set aside each year for dredging any possible deposit in the harbor. Outside of a few abnormally low priced contracts it may be said that the cost of dredging in 23-foot water in the Main Ship Channel, when the spoil can be dumped on the flats is about 35 cents per cubic yard; and when it has to be taken out to sea, about 45 cents per cubic yard. At the latter rate, the \$100,000 interest would pay for dredging 222,222 cubic yards each year, equal to a superficial area, of 6,000,000 square feet dredged to a depth of one foot. Or, if we take all the shoals, from the junction of the Charles and Mystic Rivers to Lower Middle, where hard pan has already been dredged out to give 23 feet at mean low water; including Man-of-War Shoal, Anchorage Shoal, Fort Point Bar (outside of Fort Point Channel proper), the shoals along East Boston pier heads, and Upper and Lower Middle; these shoals, which include all between Boston and East Boston, and in Main Ship Channel down as far as Long Island, could shoal all over to a depth of about 8 inches each year, and yet be dredged out by the interest on the money saved by the dam.

BASIN AS A NAVAL RENDEZVOUS.

Besides the various advantages already considered, there is a use to which the basin might be put, which appears to me—as an ex-naval officer—to be fully as important as the sanitary and æsthetic results. I refer to the possible use of the proposed fresh water basin by the United States Navy. Iron and steel had not long supplanted wood as a material of construction for naval vessels before it was found that the new material was not only very costly to keep from barnacles, but also costly to keep free of corrosion. The former can be entirely prevented, and the latter, in great part, by keeping the vessels in fresh water.



THE HELIOTYPE PRINTING CO., BOSTON

CHARLESBANK, BOSTON, AT HIGH TIDE

Our first iron vessels, the monitors, were at one time kept, when laid up, in the east branch of the Potomac at Washington, and in the Back Channel at the League Island Navy Yard, Philadelphia. The silting up of the those places, however, drove the vessels out; and at the present time the only place on the whole Atlantic coast where naval vessels are laid up in fresh water is in the James River just below Richmond, where all monitors not required for service are kept. With our wealth of rivers it would seem at first sight as if there ought to be fresh water havens in plenty, but an examination of the coast will prove the contrary. Either the currents are too swift, or there is too much danger from floating ice, or there is too little draught of water after fresh water is reached, or the streams are too crowded by commerce to form a proper fresh-water resting place for vessels either laid up or in commission. But the proposed Charles River basin fulfills all the necessary conditions, and would give to our navy such a body of fresh water as exists nowhere else in the world so close to the sea, and at the same time within a mile of one of the largest of our navy yards. Some time ago, having occasion to visit Washington, I gave copies of the report of the Joint Board to Commodore Geo. W. Melville, the Engineer-in-Chief; and to Commodore Philip Hichborn, the Chief Constructor of the Navy. Upon subsequently writing to ask their views upon the advantages of the basin for naval purposes, I received replies, from which the following are extracts.

Commodore Melville writes:

"It gives me pleasure to say that I have made a careful examination of the report of the Board upon the improvement of the Charles River for 1894, and I think that the scheme for a fresh water basin is one in which the navy should be greatly interested. Personally I think it a grand thing, for if the locks are made large enough to take our cruisers and battle ships, it will form a most excellent fresh water basin for such craft, in assuring their good preservation at all times. Its value is not altogether one sided either, for the formation of such a basin would insure the presence at Boston, always, of a formidable vessel, either of the battleship or monitor type, which could not but be of great service in time of emergency. Furthermore, the making Boston the rendezvous for ships out of commission would necessarily leave a great deal of money there which otherwise would be spent somewhere else. This, however, is merely the Boston side of the affair. What appeals to me personally in the matter is the fact of having such a fresh water basin to lay the ships up in, and one situated so near large engine building establishments; and for the sake of the navy I hope the scheme will be carried out, for I know nothing that has been brought to my attention in recent years which, from a military standpoint, could be more advantageous to the navy."

Commodore Hichborn writes:—

"After looking over the report of Joint Board upon Improvement of the Charles River, it occurs to me that it will be a decided improvement and will also be of great benefit to the navy and the surrounding cities,

if this fresh water basin formed by the dam can be utilized in part for a reserve basin for laying up the new steel vessels of the navy.

The benefit to the naval service of a commodious and accessible fresh water basin for laying up steel ships when out of commission would be great and undeniable. Not only are their bottoms preserved from corrosion, but also from fouling, so that a ship laid up when ready for sea could be kept in reserve in that condition and not need docking when required for use. The present facilities of the Navy Department in this direction are practically nothing, and it is every year increasingly important that some place or places be provided where steel vessels, especially the smaller vessels in which the plating is so thin that a moderate amount of corrosion becomes a serious menace to their structural strength, can be protected, when not in service, from the destructive action of sea water. Such places will be particularly useful for special classes of naval vessels, such as rams and torpedo boats and harbor-defence ships, which are not designed for cruising and cannot profitably be kept in commission in time of peace, but which must be preserved in a condition as nearly as possible ready for immediate use in case the emergency arises which calls for them. Unless this class of vessels can be kept in this condition, the money expended on their construction is likely to be entirely wasted, as the chances of their being fit for service when called upon, even with the best care, after being laid up a number of years in sea water, are very small. It is highly important that these storage basins should have the following qualities: First, they should be near to and easily accessible from, both a naval fitting out and repairing station and the sea. Second, they should be so located that their successful defence in time of war would be certain; and, third, they should have a constant depth of water sufficient to insure their being always well clear of the bottom.

The fresh water basin formed by the proposed dam will fulfil the condition required for a reserve basin for such vessels as are able to pass through the draws and lock and be of great benefit to the navy."

These opinions, coming from two of the highest officers of the navy, who are charged with the designing, building and subsequent care of all the hulls and machinery of naval vessels, are worthy of the greatest consideration.

Without any change whatever in the proposed plan of the basin and lock, the following vessels could be accommodated: All the existing single-turret monitors, all torpedo boats, all gunboats of the Yorktown and Bennington class and smaller, all cruisers of the Marblehead and Detroit class and smaller. One foot greater depth, and a few feet greater width of lock would accommodate the Boston and Atlanta and similar vessels. The larger monitors, Miantonomoh, Terror, etc., would find sufficient draught and length of lock, but they are somewhat over 55 feet beam. The Minneapolis draws 25 feet, has 58 feet 3 inches beam, and is 415 feet long. The battleships Massachusetts, Indiana, etc., draw from 25 to 26 feet and have 69 feet 3 inches beam. If the lock were made 75 feet clear width, 450 feet long, and 27 feet deep, it would accommodate the largest vessel now in the navy or likely to be built. These figures should not frighten anyone, for they are not as large as the dimensions of the Tilbury lock previously mentioned, and

even the latter is exceeded by the lock at Davis Island Dam in the Ohio River, which is 110 feet wide and 600 feet long. The basin would have to be dredged out to accommodate the larger vessels, but there is plenty of room, on land to be filled in, to deposit the material.

RE-OPENING CHARLESTOWN NAVY YARD.

The advantage to this community, from a pecuniary standpoint, of having the proposed fresh-water basin used by the navy, can hardly be overestimated. The Charlestown navy yard is at present practically closed. About the only work done there is making rope, chain, anchors and like material for the Equipment Bureau. But, let the basin be a rendezvous for naval vessels, and the Charlestown yard would, as a natural consequence, be opened up as a repair station, if not for the building of vessels. The following is taken from the last annual report of Engineer-in-Chief Melville, written before he had heard of the proposed Charles River improvement: —

“Boston Navy Yard. Some of the largest and finest power tools in the country, including a boiler-making plant with hydraulic flanging and riveting machines, rolls of large size, punches, shears; hydraulic lifts, etc., are in the steam engineering shops at this yard. The tools themselves, in all the shops, are cared for and preserved from deterioration, but many of the buildings need considerable repairs and the foundations for some of the heavier tools need to be almost rebuilt. It is recommended that this yard be again used as a repair station and the shops placed in running order. No better mechanics are to be found in the world than in its immediate vicinity, and no better work has ever been done for the Government than at this navy yard.”

Not only is the navy yard itself well equipped for repairing vessels, but there are numerous private establishments in the vicinity where a large amount of work could be done if at any time necessary to make repairs with all speed. I venture to predict that if the Charles river basin once comes into naval use, we will soon thereafter have here the most important naval station in the country.

The most important station at present is the Brooklyn navy yard. The pay-roll at that yard last year was, in round numbers, about \$1,830,000, while at the Charlestown yard it was only \$341,000, or about a million and a half dollars more paid by the federal government to the mechanics and laborers of New York than to those of Boston. As long as the money has to be spent somewhere, it seems worth while to offer inducements to drop some of it in this vicinity. The above figures are for labor alone; they do not include the large amounts paid to local manufacturers and dealers for materials of construction or for stores for vessels, nor do they include the pay of officers and crews of vessels, a large part of which is spent by them in the vicinity. At the Brooklyn yard, within the last few years, the cruisers *Maine* and *Cincinnati* have been built, and the finishing touches, such as armor, turrets, etc., put on the

monitors Miantonomoh, Terror and Puritan. The amount of miscellaneous work done there can be gathered from the following extract from Engineer-in-Chief Melville's report for last year:—

“New York Navy Yard: Repairs have been made to the machinery of the following ships, or stores and outfits have been prepared for them: Alarm, Alliance, Atlanta, Baltimore, Bennington, Boston, Castine, Catalpa, Chicago, Cincinnati, Columbia, Cushing, Dolphin, Fern, Kearsarge, Lancaster, Leyden, Machias, Maine, Marblehead, Miantonomoh, Michigan, Monongahela, Nantucket, Narketa, New York, Nina, Philadelphia, Puritan, Raleigh, San Francisco, Terror, Texas, Traffic, Vermont, Vesuvius, Yorktown, Minnesota and Portsmouth.

Compare the above with the following extract from the same report regarding the Charlestown yard:—

“Small repairs were made to the machinery of the following vessels: Iwana, Rocket, Fern, Vesuvius and Wabash.” (Three tugs, a non-descript, and a hulk).

The following, from the report of the Secretary of the Navy for the year 1893, are the estimates of amounts required in one year for one naval bureau alone, the Bureau of Yards and Docks, for works of improvement in navy yards:

| | |
|---|----------------|
| For Brooklyn, N. Y. | \$1,788,661.92 |
| League Island (Phila.) | 1,331,040.33 |
| Norfolk, Va. | 1,167,950.00 |
| Mare Island (San Francisco), Cal. | 1,357,807.05 |
| Boston, Mass., only | 72,000.00 |

A comparison of these figures will give some idea as to what we may expect if we can make it advantageous to the government to re-open the Charlestown yard.

IMPROVED RAILROAD FACILITIES.

In order to make the basin of full use to the navy, it will be necessary to widen the draws in all bridges, as well as to make the lock larger than originally contemplated, and this is another place for the tax-payer to pause and inquire if the results are going to warrant the expense. But here, again, the dam comes to our assistance. The river below the dam serves two principal purposes: 1st, to allow the passage of vessels; and 2d, to allow the passage of the upland water and the tidal flow. At present the only part of the river which serves the first purpose is that part in line with the draws, limited by the width of the draws to about 40 feet. If we could remove the tidal flow, which is very much greater than the upland flow, we could reduce the channel to such a width as would be sufficient for the latter, which condition would be met by a channel much narrower than that through the draws. But the building of the dam will remove the tidal flow, and so remove the necessity for a wide channel. Let us suppose then that we locate a

new channel, nearer the Charlestown shore than the present one, so as to be able to get a more direct passage, and make it as wide as may be necessary for the passage of the largest naval vessels, say even 100 feet wide. Let us line this channel with sheet piling, like a ferry slip, to make an easy passage, and across this channel let us build new draw bridges, giving a clear span the whole width of the channel. Then let us fill in the remainder of the river, from Craigie's bridge to Charles River bridge, or at least to Warren Street bridge, leaving a channel, as at present, connecting with Miller's river. A great part of this newly made land could be turned over to the railroads on terms which would at least repay the cost of filling in and building new draws. This would greatly increase their now very limited terminal facilities, and be of immense benefit to them as well as to the community. Other portions of the land could be used to increase the highway accommodations from Boston to Charlestown and Cambridge, at much less cost than new bridges as now proposed, at the same time providing a thoroughfare for such rapid transit lines as may be built. Such parts of the land as might not be needed by the municipalities and the railroads could be sold to private parties. Part of the existing wharfage between the Charles River and Craigie's bridges could be reached by slips from the main channel, and a part could be transferred to the northern edge of the newly made land, along the line of the Charles River bridge. The material for filling in this land would come from the fresh-water basin by hydraulic dredging, thus taking the material from a place where it is not wanted, and putting it where it will be of use, and that, too, at comparatively small expense.

The filling in of this land would permit the railroads to so arrange their tracks and draws that trains need never be delayed by an open draw. A branch track could be arranged at such a distance below (or above, if more convenient) the main line that, if the draw in the latter were open to admit a vessel, the draw in the former would be closed and could be used by trains. The two draws could be easily arranged to interlock with the switches controlled from the signal tower, so that trains would always have a clear track.

People who are accustomed to seeing the present 40-foot draws, should not be appalled at the thought of 100-foot spans. Our 40-foot draws are sufficient for our present needs, but they are no more than toys as compared with what are used elsewhere. Engineers find no difficulty in building such draws as the 200-foot clear span of the London Tower bridge, or the two 206-foot clear spans of the railroad bridge over Arthur Kill, Staten Island. But our needs would be satisfied by the very moderate clear span of 100 feet at the most, of which we can find examples by the score, a very good recent example being the New York Central Railroad bridge over the Harlem river.

Although I have mentioned the feasibility of filling in the river below the dam in connection with the use of the basin for naval purposes, there is good reason for doing this filling even if the basin be not put to

such use. This space can serve us better in the form of dry land, to expedite traffic, than in the form of an unsightly waterway, of no use but to pass filthy water back and forth.

THE TEREDO NAVALIS

We may speculate as much as we please on the desirability, or otherwise, of building new draws; but there is a possibility that the matter will not be left to us at all, but that the controlling vote will be cast by a recently arrived and unwelcome addition to our community. I refer to a well-known marine parasite, the *Teredo Navalis*, which has hitherto been a stranger in this latitude, although it has been for years the terror of more Southern harbors. This little animal makes short work of unprotected wood, honeycombing it, by boring, in an incredibly short time; but he works only in salt water. This parasite first appeared in Boston Harbor in 1893, making his presence known by nearly sinking two scows belonging to the Eastern Dredging Co., within six months after they were built. (See Report of City Engineer, Boston, for 1893, p. 37. Also a very interesting article on the subject by Henry Manly, C. E., in the Journal of Association of Engineering Societies, May, 1894, p. 243.) The history of this little animal shows that wherever he has once made his appearance, he remains permanently; the only protection against his ravages being the use of some woods which he does not attack, such as palmetto, or the covering of other woods with copper, zinc, or cement. Whether or not this new-comer has obtained a permanent foothold here (if such an expression may be applied to a jelly-like worm) it is impossible to say at present; but if he once starts to feast on those eleven thousand piles of the Charles River bridges he will make short work of them.

THE MASSACHUSETTS STATE BOARD OF HEALTH.

In conclusion I would beg to refer again to the sanitary phase of the question, and to say that in my humble opinion the strongest possible reason for believing that the proposed basin would be a sanitary improvement, instead of a sewage-polluted pool as claimed by the remonstrants, is the fact that it is advocated by the Massachusetts State Board of Health. Outside of the ranks of engineers and sanitarians, there are probably few people who realize that our State Board of Health is, by common consent, the highest authority in the world on the subject of sewage disposal. The researches of its engineers, biologists and chemists, the results of its work at the experimental station at Lawrence, and its practical results in successful sewage disposal are known to the engineering profession all over the civilized world, and used without hesitation as the most reliable precedents. It is next to impossible to take up any recently published work on the subject of sewage, without finding copious references to the work of the Massachusetts State Board of Health. Take for instance the recent work on "Sewage Disposal" by Wynkoop Kiersted, C. E., of Kansas City, 1894. In this work I find

no less than nineteen references to the work of the Massachusetts State Board of Health, or quotations from their reports. The author's opinion of their work may be shown by the following quotations:

"The author has freely quoted from the records of this Board, in order to outline the utility of intermittent filtration for the disposal of sewage, and because they are more complete than any previous experiments."
 . . . "Probably no experiments that have ever been made to determine the principles involved in purification of polluted water by intermittent filtration have been so comprehensive in their scope, or so completely recorded, as have the experiments made by the eminent scientists and specialists under the direction of the State Board of Health of Massachusetts. The results are worthy of the skill, time and expense bestowed upon them; for they are fruitful in matters of general interest and importance."

In his latest work on sewage ("Modern Methods of Sewage Disposal, 1894), Col. Geo. E. Waring, Jr., of Newport, R. I., makes twenty-odd references to the work of the Board of Health, with such remarks as the following:

"During the years that have since elapsed, the most important investigations of the Massachusetts State Board of Health, carried on at the experiment station at Lawrence, under the direction of Mr. Hiram F. Mills, C. E., have confirmed the theories then held, and have thrown much light on the methods by which they may best be reduced to practice. It was only after this clear definition and demonstration of the processes involved, and of the methods of their application, that we were in a position to work with real knowledge. Then only could empiricism be made to give place to well-established theory."
 . . . "These systematic studies have added greatly to our knowledge, and have given us certain clear indications as to the requirements of practical disposal. They have, in fact, so determined the theory on which successful practice must be based, as to constitute the most important step thus far taken, . . ."

The most important work on this subject which has appeared during the present year is "Sewage Disposal in the United States," by Geo. W. Rafter, C. E., of Rochester, N. Y., and M. N. Baker, Ph.B. of New York City. Upon referring to the index of this book, one will find the item, among other references to the Board of Health,

"Massachusetts State Board of Health, reports on stream pollution, best thus far made anywhere."

And the authors thus pay tribute to the Board in the text:

"The history of stream pollution and the discussion of measures for its abatement have been confined in this country, until recently, almost entirely to the Reports of the Massachusetts State Board of Health. Something has indeed been done in several of the other States, but to Massachusetts must be assigned the credit of not only first taking up the subject systematically but of materially advancing accurate knowledge of the subject. In making the preceding statement the authors have not overlooked the work done in several of the other states, as for

instance, Maine, Connecticut, New York, New Jersey, Minnesota and Illinois. A large portion of the work in other states, is however, considerably later in point of time than that in Massachusetts, and some of it has been modelled after the Massachusetts work as published from year to year in the Annual Reports of the State Board of Health. The credit of a systematic beginning therefore, properly belongs to Massachusetts." . . .

The latest prominent English work on the subject is "Sewage Disposal Works," by W. Santo Crimp, C. E., London, 1894. The author, who has been in charge of the main drainage of the northern section of London, prefaces his references to the Massachusetts work as follows:—

"During the years 1888-92 an elaborate series of experiments was carried on by the Massachusetts State Board of Health, and the results are given in great detail in three important volumes; indeed, it is not too much to say that these volumes contain more reliable information relating to the chemistry of sewage treatment, and the filtration of the effluent, than any others hitherto published." . . .

In view of such testimonials as the above, and of the practical results of the work of the Board, can anything more absurd be imagined than the objections of a few non-professional persons to the proposed Charles River improvement? If Gilbert and Sullivan should ever find that the public demands something more ludicrous than "Pinafore" or "Patience" or others of their famous productions, they may find a suitable theme, replete with absurdity, in the present remonstrance against the action of the *Massachusetts State Board of Health* as tending to produce *unsanitary results*.

Very respectfully,

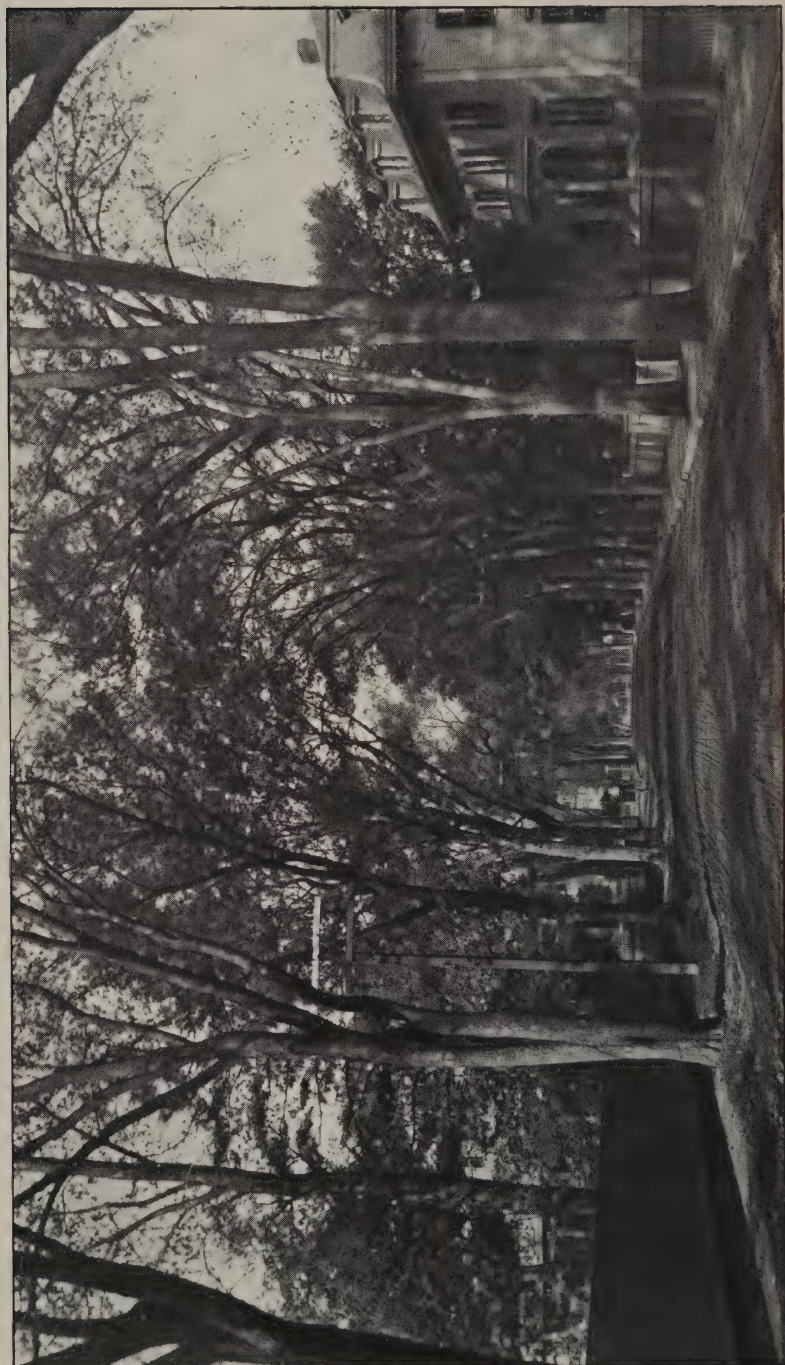
ASA M. MATTICE.

Accompanying this report will be found the reports of the General Superintendent, the Landscape Architects, the City Engineer and the special laws and ordinances relating to this Board, all of which are respectfully submitted for your consideration.

HENRY D. YERXA,

JOHN O'BRIEN,

GEO. HOWLAND COX.



VIEW SHOWING SOME OF THE HARVARD STREET ELMs.

REPORT

OF THE

GENERAL SUPERINTENDENT OF PARKS.

CAMBRIDGE, December 1, 1894.

To the Board of Park Commissioners of the City of Cambridge:

GENTLEMEN:—I have the honor to present my first annual report as General Superintendent of Parks, covering the period from the date of my appointment, March 1, 1894, to the present date.

SHADE TREES.

For many generations the shade trees upon the streets of Cambridge have been the pride of residents and the admiration of visitors. How much our city is indebted to its trees, not merely in the matter of adornment but for utilitarian reasons as well, it would be difficult to state. Cambridge territory, in contrast with some of the neighboring cities and towns, has few natural opportunities for fine landscape effects; but in the extent and beauty of its foliage and in its magnificent specimens of native trees, our city, in the past, has offered an attraction to home-builders which has been no small factor in the city's growth. While we would search in vain upon the assessors' lists of public property for an inventory of the shade trees, it would not be a difficult task to show that, collectively, these trees are among the most valuable of the municipal properties. Large as the amount is which has been recently appropriated for park development in Cambridge, this sum comes far short of representing the value of the city foliage already established. A discussion at some length upon the present condition and needs of the public shade trees may not, therefore, be deemed out of place, especially when it is considered that no extended official report has ever before been presented upon this subject.

By the ordinance established March 13, 1894 (Sec. II.), it is ordained that "the Park Commissioners shall have the care of the trees in the public streets." Prior to this date, as far as the public records show, the street department has been the custodian of the public trees. Why this arrangement was made in the beginning, and why it was for so many years continued, is not apparent. But that the art of urban

forestry—an art requiring special knowledge, cultivated taste and a natural sympathy with plant life—should have been made an adjunct of the strictly mechanical business of road building, shows that the governing powers in the past have been largely indifferent in the matter of shade tree cultivation. Indeed the city corporation has done but little to foster our shade trees, and that little has been done without system. We must look to quite a different source to account for the care bestowed upon Cambridge trees in the past. Intimations of this may be seen in the literature of Lowell and Longfellow and others, and the service which these eminent Cambridge citizens have rendered in creating and sustaining a discriminating sentiment for tree culture in their home city, is beyond calculation. As long as the Cambridge classics are read, Cambridge trees will be fondly regarded.* And to this high work must be added the valuable services rendered in the past by the numberless citizens who, although without “the power to charm a listening world,” have given individual effort to tree culture upon our public streets, and have never failed in voice or act, to come to the defence of our leafy inheritance whenever it was assailed by men of “arboricidal instincts.”

But however valuable individual effort has been in the past, it is evident that the time has come when the matter of tree culture upon our public streets and reservations, must be made a municipal enterprise. The hard conditions of “congested” urban life are coming upon us. Gradually the surface of Cambridge is being encrusted with macadam and bricks; the lawns which separated the buildings from the sidewalks are disappearing in the yawning cellars of modern structures; apartment houses rise above the tree tops; electric-light wires wither and kill the foliage above, while escaping gases suffocate the roots beneath. In the earth, on the surface, and above, the enemies of shade trees increase at an alarming rate, with the increase of city conditions. Thoughtless owners of horses abound, who allow the appetite of a fifty-dollar animal to destroy a thousand-dollar tree. The axe of

* “A life of between two and three centuries seems a long one in a new country like ours, and ‘the old elm’ is often the most ancient monument of a New England village. I myself am fortunate enough to remember a number of old monumental trees in my native town of Cambridge, Massachusetts. When I first rolled my infant eyes toward the glare of the western sky as it looked through the windows of my birth chamber, four green masses, each of them ‘a forest waving on a single stem,’ as I put it in verse long afterward, printed themselves on my retina through my blinking eyelids. One was an old patriach which fell, I think, either in the great September gale of 1815, or at about that time, but I remember its stump with a certain reverence. On the opposite side of the Common stood the ‘Washington Elm,’ now senile, and soon to be father and godfather of innumerable canes, crosses, picture frames, and other relics. North of that stood a fair outspread tree, which from its form I always called the ‘coral fan,’ and beyond that another, handsome, but un conspicuous. There was another noble elm, long since vanished, which over-arched the highway that leads west from Harvard Square to Mount Auburn. These trees entered into my young life as truly as the milk that made its blood. Why should I not love their memory and linger over it?”—*Oliver Wendell Holmes.*

the road builder becomes more terrible than ever the "woodman's axe," because directed by official hands; the change in the grades of streets, so often and so mysteriously decreed, is a sentence of death to many a mighty monarch of the ancient Cambridge forest. Ungainly telephone poles are substituted for living trees, and are planted with all the ceremony which city orders and ordinances can command, as perpetual, monuments of the trees which were removed without thought or care.

It is evident that individual efforts, however manfully maintained, are no longer adequate in the matter of tree preservation. The deterioration so painfully evident to even casual observers, can be checked only by the systematic effort of an organized department of the city works. Let the tendency which has been growing for the last decade, continue but for a few years longer, and Cambridge, from being a city noted for her abundance and beauty of foliage will descend to the list of nearly barren cities. The work of tree planting can no longer be left in safety to individuals. Trees are long-lived and therefore of slow growth. Men are short-lived at the best, and families are less firmly established upon the soil than was formerly the case in Cambridge. They do not, therefore, readily begin a work which they or their children will probably never see mature. But the city will have long life—longer, let it be hoped, than the most promising tree—and so can very properly engage in a work which will continue through many generations of men.

Again, systematic official effort is now needed, not only to preserve what we already have; but also to raise the standard of shade tree culture to the requirements of the more cultivated taste which now prevails in the art of urban forestry. The rules of city street decoration no longer permit each individual property owner to plant trees how and where he pleases. Street planting must be directed with reference to the street as a whole. Already it has been suggested that all architectural work upon a street should be in harmony with a general plan, and that individual tastes should not be permitted to spoil the general landscape effects, by incongruous or eccentric efforts. But the public taste is not yet educated to this standard, and no doubt private rights will be urged long and vigorously before such a standard is reached. In the matter of shade tree culture, upon the public streets, however, the questions of individual rights, cannot reasonably be insisted upon.

Good taste demands the observance of two rules as essential in street tree planting. First, that but one variety of tree shall be planted upon a street, and, second, that the trees shall be planted at uniform distances.

This rule of a single variety has seldom been observed in Cambridge, and our citizens have to go to other cities and towns to learn what magnificent effects are possible when trees upon a single street are carefully matched not only as to variety, but also as to size and habit of growth. Some few attempts have been made from time to time, as in the case of Maple avenue, which is finely wooded with the double row of silver leaved maples planted by Chas. M. Hovey in 1854,—this species of maple

being then a novelty in street planting; and another instance is the noble line of elms upon Craigie street. But upon neither of these streets, has the original plan been maintained, other varieties having been added by more recent planters, to the great injury of the original plan.

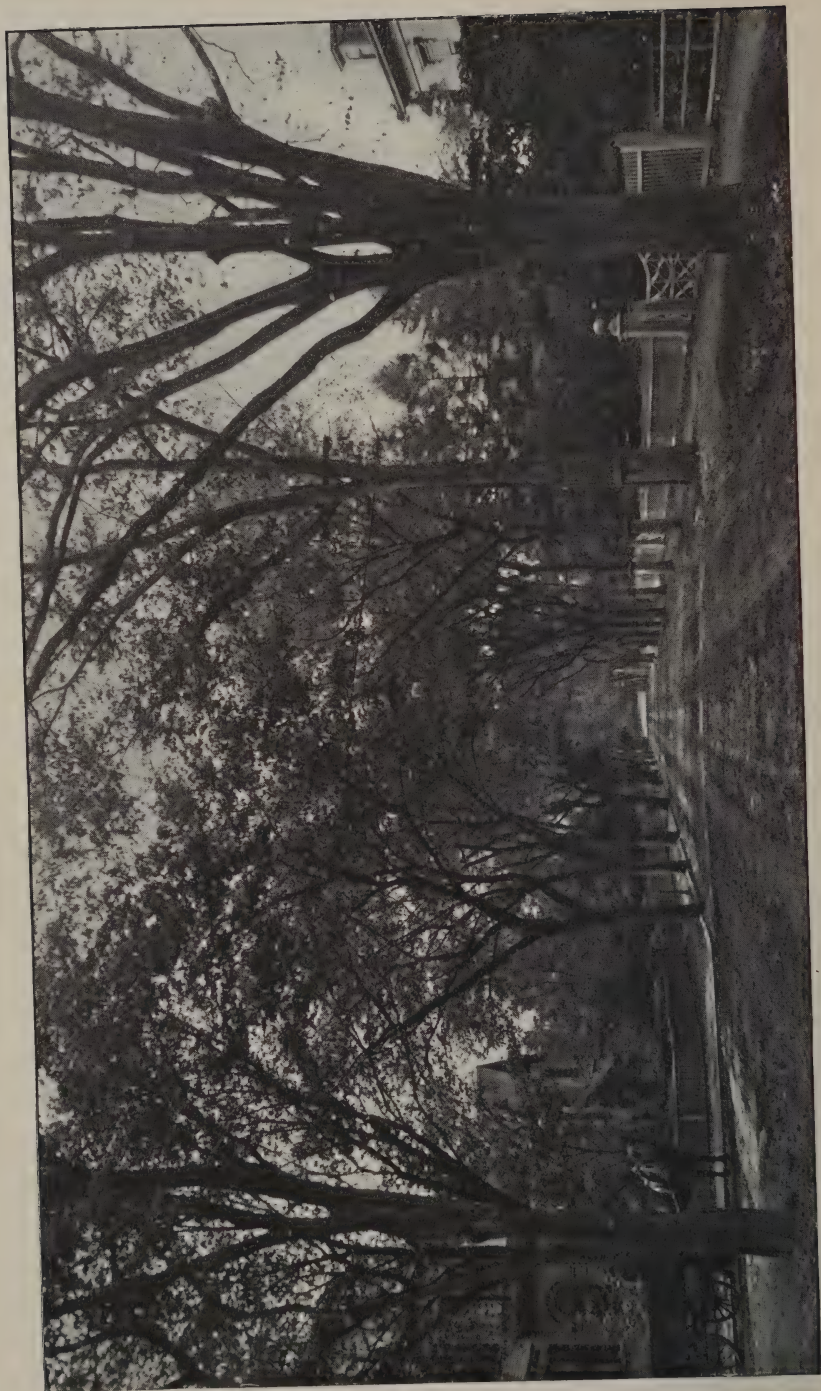
In discussing this matter, Prof. Charles S. Sargent has said: "The importance of following in all street and roadside planting the rule which requires that every connected street must be planted with a single variety of tree, should be insisted on. This plan is universally adopted in Europe, and its advantages over that which mixes various trees widely different in habit, rapidity of growth, and longevity, in the same street plantation are very great. This will be seen by comparing the effects produced by the rows of elms on the mall in Central Park, or by the magnificent avenues of live-oaks near Savannah and on Cumberland Island, Georgia, with the mixed plantations too often seen in this country, and in which alternating elms and maples form a favorite combination."*

In this opinion Prof. Sargent is not alone. Indeed, among authorities in shade tree planting, this opinion is unanimously held and alternate or indiscriminate planting is no longer tolerated in communities where good taste prevails. The excellent work which has been done in the town of Brookline in recent years, might well be imitated in Cambridge.

The second rule, that of planting at regular distances, would seem to need no recommendation to merit general approval. And yet there is hardly an instance where a row of trees of any considerable length has been planted in this city, previous to this year, in which this rule has been strictly enforced. It does not appear that trees have ever been planted in Cambridge with sole reference to the decoration of the street as a whole. Invariably the desires of individuals have intruded, and the rule of regular distances has been deviated from to conform to the innumerable fancies of the abutters. Often residents are impatient at the slow processes of nature, and in order to get a mass of foliage at once insist that the young trees be placed but ten or fifteen feet apart. Others, caring more for sunshine than for shade, insist that a gap of fifty or one hundred feet be left unplanted. And thus the fine effect of regular distances which might otherwise be obtained, is hopelessly lost, because individual preferences are not subordinated to the higher interests of the whole community.

In assuming the care of the shade trees, it is clearly the duty of this department to inaugurate the new and better system of planting, and it is hoped that the people in general will appreciate this. The rule of distances is a simple one. Trees should be so planted that at maturity they will not quite come together. A consideration of the size and habit of the mature tree is, therefore, necessary at the time of planting. Thus

* Introduction to Professor Sargent's translation of *A Treatise on Pruning Forest and Ornamental Trees*, by A. Des Cars.



ELM TREES ON CRAIGIE STREET.

rock maples should be given a distance of thirty feet, and Norway maples, if the soil be favorable to vigorous growth, five feet more. American elms should seldom be placed nearer together than at intervals of fifty feet.

Of the kind of trees to be planted in Cambridge streets, two genera have special value, the elm and maple.

The American elm has claims upon Cambridge above that of any other tree.* Not a few specimens of native growth yet remain upon our streets, trees which "were never carted hither," and whose roots have never been handled. The Washington elm, the three mighty elms near the Botanic Garden on Linnæan street, the Whitemore elm on North avenue, the elm in the Brattle street roadway, all relics of "the ancient self-sown, inviolated woods," are of the race which can have no rivals in the heart of the man who regards Cambridge soil

"And loves his old contemporary trees."

From the beginning, the American elm has been the wayside tree of New England. It was more often spared than any other tree when the early settlers made their "clearings," and each succeeding generation has planted and cherished it above any other. Such continued expressions of choice could not now be disregarded, even if there were no arguments in favor of the elm except the repeated decrees of the people of New England. But there are abundant reasons for the choice. No other tree can compare with the elm. No other tree combines in itself

*"We consider the White American elm peculiarly adapted for planting, in scenes where the expression of elegant or classical beauty is desired. In autumn the foliage assumes a lively yellow tint, contrasting well with the richer and more glowing colors of our native woods. Even in winter it is a pleasing object, from the minute division of its spray and the graceful droop of its branches. It is one of the most generally esteemed of our native trees for ornamental purposes, and is as great a favorite here as in Europe for planting in public squares and along the highways. Beautiful specimens may be seen in Cambridge, Mass., and very fine avenues of this tree are growing with great luxuriance in and about New Haven."—*A. J. Downing's Treatise on Landscape Gardening, written in 1849.*

"The early settlers of New England inherited from their English ancestors the love of liberty and the love of home; for the maintenance of the one they planted the common school, and for the adornment of the other, the wayside tree. In front of the new house for the bride, the bridegroom placed the memorial elm. Bride and bridegroom have passed away, and generation after generation of their descendents; the old houses have mostly made way for less substantial, but more showy successors, or else have been modernized out of existence; and the trees themselves of colonial date are fast disappearing. The reasons that led to the frequent choice of the elm as a shade tree are obvious; it is a comparatively rapid grower, is safely transplanted, requires little care, admits of the severest pruning, and combines, in a remarkable degree, when old, size and beauty."—*L. L. Dame, in "Typical Elms and Other Trees of Massachusetts."*

"The more our elms are studied, the more we recognize that it is the favorite of Nature above all other ornamental trees in our New England flora."—*Oliver Wendell Holmes*

the elements of variety, size, strength and grace as does this monarch of all the trees.*

At the present time, when it is the fashion in certain quarters to speak slightly of the American elm as a shade tree, it is perhaps not amiss to dwell at some length upon its many good qualities. It is true that the elm has many insect enemies.† But here in Cambridge, at least, this fact has never been so serious as to render the elm an undesirable street tree. Indeed, of the single insect pest of this year—the *Orgyia leucostigma*—the elms suffered far less than did the horse-chesnuts and the lindens.

*“Other trees may represent single dendrological ideas; but in the elm we have nearly, if not quite, all the tree virtues combined. A village shaded by those incomparably most magnificent of all earthly trees, elms, can not be but handsome. Its houses may be huts, its streets may be ribbed with rocks, or channelled with ruts; it may be as dirty as New York, and as frigid as Philadelphia; and yet these vast, majestic tabernacles of the air would redeem it to beauty. . . . We had rather walk beneath an avenue of elms than inspect the noblest cathedral that art ever accomplished. . . . Such domestic forest treasures are a legacy which but few places can boast. Wealth can build houses, and smooth the soil; it can fill up marshes, and create lakes or artificial rivers; it can gather statues and paintings; but no wealth can buy or build elm trees—the floral glory of New England. Time is the only architect of such structures, and blessed are they for whom Time was pleased to forethink.”—*Henry Ward Beecher*.

“I will confess that I join in the admiration so generally bestowed upon the American elm. To me no other tree seems so beautiful or so majestic. It does not exhibit the sturdy ruggedness of the oak; it is not so evidently defiant of wind and tempest. It seems, indeed, to make no outward pretensions to strength. It bends to the breeze which the oak defies, and is more seldom, therefore, broken by the wind. It is the most drooping of the drooping trees, except the willow, which it surpasses in grandeur and in the variety of its forms. Though the elm has never been consecrated by the muse of classic song, or dignified by making a figure in the paintings of the old masters, the native inhabitant of New England associates the varied form of this tree with all that is delightful in the scenery or memorable in the history of our land.”—*Wilson Flagg*.

“With its endless variety of beauty, it is not wonderful that the American elm should be the greatest favorite with the New England people. And it has the additional recommendation of retaining much of its beauty when the foliage is gone. The sturdy trunk and the airy sweep of the branches are always there; and few objects of the kind are more beautiful than the feathered, alternate regularity of the spray upon the outmost or uppermost boughs. With the earliest spring, these are fringed with numerous branches of red blossoms, soon to give place to the soft, delicious green of the young leaves. Coming with such recommendations, the elm is more frequently transplanted than any other forest tree; and, from the vigor and number of its roots, it is more sure than any other to live. In the excellent practice, becoming every year more common of ornamenting town and village and sheltering sunny roads with rows of trees, the elm is chosen often to the exclusion of all other trees,—of trees, too, which, much as we value the elm, we cannot but consider its equals and often its superior,—the maples, the ashes, the birches, the beeches, and even of the lordly oak itself. But the elm bears pruning better, and requires less, than almost any tree; for it usually throws out no branches below a height of twelve to twenty feet. It grows, too, with great rapidity; for its roots run, just beneath the surface, to a great distance and thus get the best of the soil.—*Geo. B. Emerson in “Trees and Shrubs of Massachusetts.”*

†“Besides the determined species of insects found on the elm, Professor Riley has kindly furnished me with notes upon forty-two species additional, but not yet determined. This carries the number of elm insects up to the neighborhood of one hundred and twenty-five species.”—*A. S. Packard, M. D., Ph.D., in Fifth Report of the United States Entomological Commission.*

But while the American elm should be freely planted, it should be planted intelligently. It should be placed only on the longer and wider streets, where the wide-spreading branches may form the high Gothic arch through which stretches a limitless vista.* Some of the main highways of the city, such, for example, as Harvard and Magazine streets, should be devoted entirely to elms, and all the tree work done upon these streets from this time forth should be with the purpose of finally establishing well-matured specimens of *Ulmus Americana* at regular distances throughout their entire lengths.

The genus *Acer* in its many species, is the next favorite tree in Cambridge. The maples have been thoroughly tested upon our streets for years, and have proved themselves invaluable. The rock maples (*Acer saccharinum*) are the most numerous, and many well-developed specimens are to be found. It has many excellent qualities. In beauty of form it cannot be excelled, and no shade tree is cleaner. Its leaf period is long, and the tree lives to a good and vigorous old age. Its brilliant autumnal coloring is an added attraction. Its slow growth, however, must be regarded as a disadvantage, and, in comparison with the Norway maple, its endurance through dry weather is not so great. The past season having been a remarkably dry one, this fact was very noticeable, many of the rock maples dropping their leaves in September while their neighboring Norways suffered but little.† The Norway maple (*Acer platanoides*) is a species which is everywhere gaining in favor. Of much more rapid growth than the rock maple, it is possible in a few years after planting, to produce a beautiful tree of spherical form and dark-green foliage, a veritable "globe of vegetable darkness." It has proved itself to be well adapted to Cambridge soil and climate. The silver-leaved maple (*Acer dasycarpum*) has been a popular tree in this city on account of its extremely rapid growth. For quick effects, no tree is more often used. Its period of usefulness is, however, short, and its old age is a time of trouble for whoever has the care of it. The storms make havoc with the branches, and its last days are anything but beautiful. As the statutes make no distinction between a picturesque and an ugly old age in shade-tree life, and as the

* "Took a long walk before sunrise. The whole horizon tinted with rose. 'An earth-surrounding hedge of roses.' At the end of a long road, under the leafless arches of the elms, a bright blue patch of sky; the trees themselves more than ever like columns and ribbed ceilings of churches.—H. W. Longfellow's Journal. Dec. 12, 1849.

† The total amount of rainfall from March 1, to October 1, 1894, was 16.13 inches, being the smallest amount since the memorable drought of 1883. The following is the record since 1877, from March 1 to October 1, of each year as recorded at Fresh Pond:—

| | | | |
|-----------|--------------|-----------|--------------|
| 1878..... | 27.24 inches | 1887..... | 21.70 inches |
| 1879..... | 25.38 " | 1888..... | 35.99 " |
| 1880..... | 18.56 " | 1889..... | 33.72 " |
| 1881..... | 24.77 " | 1890..... | 31.75 " |
| 1882..... | 23.71 " | 1891..... | 24.38 " |
| 1883..... | 14.52 " | 1892..... | 25.10 " |
| 1884..... | 26.12 " | 1893..... | 25.20 " |
| 1885..... | 21.25 " | 1894..... | 16.13 " |
| 1886..... | 22.70 " | | |

aldermanic edict is required in either case before the tree can be cut down, it would seem wise to plant silver-leaved maples sparingly.

The American elm and the three species of maple already mentioned are not the only useful trees for street planting in Cambridge. It is not, however, the purpose of this report to discuss the relative merits of the half hundred different trees which are used for street work. As most of the planting now being done upon Cambridge streets is confined to the trees already named, these trees have been dwelt upon at some length. The plans for the future include the oak in many of its most desirable species, the ash, the linden and others. Future reports may present opportunities for the further discussion of what trees are best suited for street planting in Cambridge. It is a question upon which there will always be differences of opinion, and upon which those who have given the most study will be the least inclined to dogmatize.

SUPERFLUOUS TREES.

Because a strong appeal has been made for the preservation of our shade trees, it must not be inferred that all attempts to remove superfluous or decrepit trees are to be antagonized. Pruning and felling are as much parts of the work of the city forester as planting. The axe is as much needed upon some of our streets as is the spade upon other streets. There are streets where the argument is all in favor of the axe, and where decided improvements would come if some of the trees were removed. Beautiful prospects might thus be opened up which are now hid ; quiet shade would take the place of dense gloom, and the dampness of the soil would no longer be a menace to the health of residents. A rational tree-lover will not take delight in the struggle of two trees for a bare existence in a space where one fine specimen might grow. Neither will the person who really admires fine trees object to the removal of a tree when it has fulfilled its mission. A tree, like everything else, has one life. It has its beautiful period of early growth ; its time of magnificent maturity, and its age of decay. In its last stage of decay, a tree upon the public street is seldom a picturesque object, whatever it might have been in its native woods. It is a pitiable sight which every discriminating tree-lover will wish removed by a decent burial. We have it from the highest authority that it is possible for a tree to cumber the ground.

But the removal of a tree should be decided upon principle, and wholly upon the merits of the case. In the eye of the law, a tree stands innocent until proven guilty to the satisfaction of a majority of the Board of Alderman, after a careful public trial. No tree may be removed from the public streets of the cities and towns of Massachusetts until it has been shown that its removal would be for the public good. This is public sentiment as recorded in statute law, that a tree has a right to live. And although this statute, which makes it so difficult to remove trees, sometimes works to the public inconvenience, it is a wise provision. "A tree is the slow product of many years of Nature's bounty working



WASHINGTON ELM.

Showing the cavity in the trunk after dressing and an application of coal-tar.

under favorable conditions. It is a precious inheritance from the past, and should be transmitted to posterity with as keen a sense of its artistic value as though it were a famous picture or statue." Some of the shade trees upon our streets are older than the Nation. It is a wise law, therefore, which provides that the burden of proof shall rest with those who suggest their removal.

During the year, 87 trees have been felled and 224 young trees have been planted.

THE WASHINGTON ELM.

With the transfer of the care of the shade trees from the Street Department, the Park Department became the official custodian of the Washington elm. The condition of this tree last spring was very bad. The ends of some of the limbs which have been cut off in previous years, had decayed back to the trunk, and the decay had extended down one side of the trunk to the ground. The covering of sheet zinc which had several years ago been placed over the wounds, instead of protecting the wood, had hastened decay by retaining the moisture, and by affording a convenient screen for insects.

Professor Charles S. Sargent, of the Arnold Arboretum, was consulted as to the proper treatment of the tree, and, under his supervision, the work of restoring the tree has been done this summer. The decomposed matter in the cavities, amounting to some three cubic yards, was removed, and the wounds carefully scraped until sound wood was reached. Two coats of coal-tar were then applied.

The following communication from Professor Sargent explains the condition of the tree:—

HARVARD UNIVERSITY, ARNOLD ARBORETUM, }
JAMAICA PLAIN, Mass., November 13, 1894. }

GEORGE R. COOK, Esq., Cambridge, Mass.

MY DEAR SIR:—Referring to our various conversations about the Washington elm in Cambridge, it seems to me not improbable that this tree can be kept alive for many years, possibly for fifty or one hundred years more, if the progress of decay can be stopped by amputating the decaying ends of the branches, by removing all the decayed wood from the interior of the trunk and limbs, by carefully covering and keeping covered with coal-tar all such exposed places, and by destroying, if possible, the ants and other insects working in the wood. The tree is suffering, of course, from the fact that it stands in the highway and that all the water which falls on the ground near it runs off from the surface without penetrating to the roots. If the ground about the tree could be dished in such a way that it would receive a better supply of moisture than it does now, its health and vigor would no doubt be increased.

Yours very truly,

C. S. SARGENT.

The following letter was received from Mr. S. H. Scudder, and resulted in a conference between Mr. Scudder and Professor Sargent. The work proposed by Mr. Scudder can best be done in the early spring:—

CAMBRIDGE, 156 Brattle Street, August 24, 1894.

To the Park Commissioners, Cambridge, Mass.:

DEAR SIRS:—I beg to call your attention to the condition of the Washington Elm. The means that have recently been taken for its preservation are not sufficient, as an inspection will quickly show. The ants are everywhere burrowing the wood, and by their passages are exposing the whole interior to the action of the air. To be thorough, every one of these holes should be plugged with cement, and new holes plugged as fast as made. An ant is not an easily discouraged insect, but I think this would lead them to apply their efforts elsewhere. If bisulphide of carbon or even the fumes of burning pyrethrum were blown into the holes before plugging, it would doubtless make the work more thorough by rapidly diminishing their numbers. If the work of the ants is not materially checked, the tree will lose some decades of its possible life.

Yours respectfully,

SAMUEL H. SCUDDER.

WORK ON INSECTS.

The trouble with insect defoliators upon the shade trees, this year, has been almost entirely confined to the *Orgyia leucostigma* (the white-marked tussock moth). By the latter part of June the full-grown *Orgyia* caterpillars were feeding upon the leaves of the horse-chestnuts and lindens, and also, to a less degree, upon the elms and rock maples, in sections of Wards Two and Four. In the infested territory, by the first week in July, scarcely one horse-chestnut or linden tree had escaped complete defoliation. By the second week in July, the ravages had ceased, the caterpillars having gone into the pupa state, after covering the rough bark of the older trees with their unsightly cocoons.

Although the *Orgyia* is not an unknown insect in Cambridge, there is no record of its ever before appearing in equally large numbers, or of doing so much damage to the foliage. Heretofore, but little attention had been paid to them. But this year, by the middle of July, it became evident that the season was peculiarly favorable to their multiplication, and careful inquiries were made as to the habits of this insect and the extent of its depredations in other cities. The *Orgyia* has been the subject of much discussion by the various writers on economic entomology, and its ordinary habits are well-known. All agree that in the latitude of Washington there are two annual broods of this insect, and as far north as Philadelphia or even New York a second brood occasionally appears within the year. Little satisfactory information could be obtained, however, as to the probability of a second brood appearing in Cambridge this year. The extraordinary abundance of the moths in the latter part of July, and the numbers of eggs deposited, gave warning that if a second generation of the larvæ should attack the trees this year, the result would be most serious. The elms had suffered but comparatively little, but they were,

evidently, the next favorite plant-food, after the horse-chestnuts and lindens had been consumed. The horse-chestnuts had begun to put forth a second feeble crop of leaves and blossoms, and a second defoliation would undoubtedly have been fatal to not a few of them.

It was, therefore, decided not to pursue the usual course taken in the vicinity of Boston, that is, to postpone the removal of the eggs until the less busy winter months. Instead, an active campaign was commenced at once. On July 23, a party of five men began the work of scraping the female cocoons, with the eggs attached, from the trunks and branches of the trees, carefully gathering them and carting them to places where they could be destroyed. A total number of 162 days labor was charged to this work between July 23 and September 1, and the number of trees cleaned was 1,284.

The infested territory is indicated by the following list of streets, upon which the work was done: Magazine, Park, Prince, Dana Square, Perry, Pearl, Cottage, Williams, Auburn, River, Franklin, Green, Pleasant, Western Avenue, Jay, Kinnaid, Howard, Harvard, Broadway, Winsor, Moore, Clarke, Washington, Cherry, Norfolk, Boardman, Columbia, Suffolk, Austin, Worcester, Prospect, Hampshire, Tremont, Amory, Elm, Lincoln, Main, Otis, Thorndike, Spring, Vine, Second and Fourth streets.

By the first of September the public trees were very well cleaned. A sufficient number of eggs were left, however, upon the trees growing upon private lands and upon fences and walls, to show that the fears of a second brood in the latitude of Cambridge were realized. From the eggs which had not been destroyed, there came, during the first week in September, a second generation of these voracious caterpillars. Fortunately the number had been so diminished that the consequences were not very serious.

The *Orgyia leucostigma* is probably destined to be one of the most serious insect pests to our shade trees. It is a peculiarity of this insect that it does not exist in any large numbers in the forests. It is found in great numbers only upon town and city trees, and never very far from human habitation. It also seeks large and old trees rather than young ones, because of the greater shelter which they offer for its cocoons, and as old trees abound in Cambridge this fact is favorable to their increase. The great increase in the ravages of this pest in recent years has been noticeable in many cities, and is undoubtedly due in part, at least, to the introduction and increase of the English sparrow. Professor J. A. Lintner, the State entomologist of New York, declares that the sparrows "afford almost perfect immunity to the caterpillars from their enemies, whether birds or insects," and he calls the *Orgyia* the protégés of the sparrow. As the first remedy to be used against this insect, he urges "a relentless war upon the English sparrow." This opinion concerning the sparrow is also held by other distinguished entomologists. Professor C. V. Riley, of the U. S. Government staff of

entomologists, in his valuable report upon The Insect Defoliators of the Shade Trees of Washington, express a similar opinion in regard to the sparrow's responsibility for the increase of this pest. The extermination of the English sparrow would, undoubtedly, be a help to the shade trees of Cambridge.

The chief trouble with the *Orgyia* will very likely come in the future, from trees upon private lands. This department has no authority to enter private grounds and remove the eggs, even if the expense of such a work could be met. Householders must, therefore, be made acquainted with the harmful results which will follow if this insect is left undisturbed, and be induced, if possible, to destroy the eggs upon their premises.*

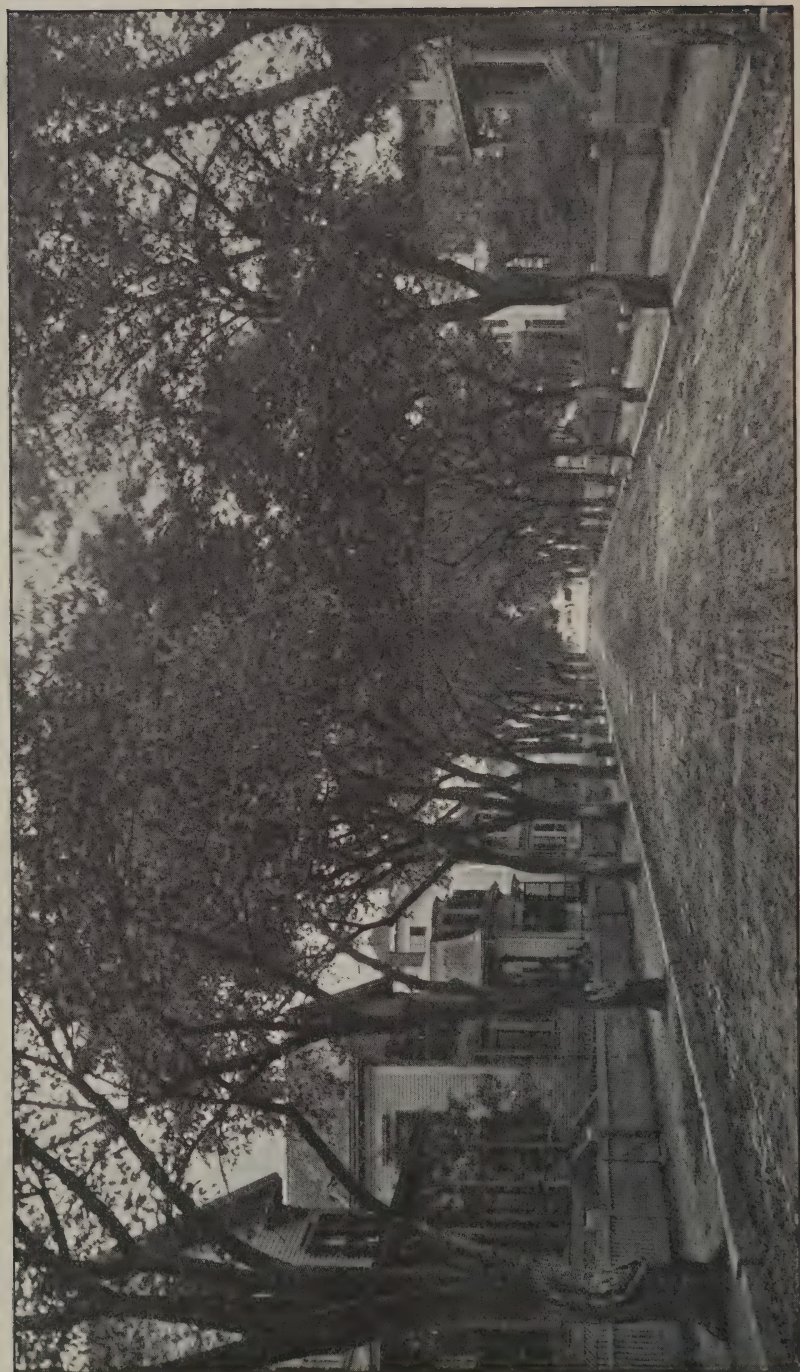
TREE GNAWING.

One of the most grievous injuries to our shade trees is caused by the gnawing of the bark by horses. The greater part of this gnawing is done in the spring, when the tree is full of sap and, therefore, most inviting to the animal's appetite, and when, also, most damage may be done to the tree. There are hundreds of trees now upon our streets, disfigured and slowly dying, with immense wounds in their trunks caused in this manner. Considerable time and effort have been spent this year in the attempt to abate this evil, and some good has resulted. Cases have been followed up where owners have allowed their horses to injure trees, and these owners have been warned of their liability to prosecution. Copies of the City Ordinance for the protection of the shade trees have been printed on cloth and posted on many trees. The agitation has also been kept up in the public press. No one, however, has thus far been prosecuted for this offense and it is probable that only by an occasional conviction and punishment can this serious injury to the trees be checked. While most of the gnawing is done by horses in the absence of the owners, there have been some cases the past year, where the owners or drivers stood by and deliberately permitted their horses to bark the trees.

But, however vigorously the ordinance is enforced, the natural craving of horses for fresh vegetation in the spring, after a winter's diet upon dry grain and hay, cannot be taken from them, and our shade trees will never be safe from this form of attack until they are protected by properly constructed guards.†

* Professor A. S. Packard notes: "The hairs of this caterpillar are quite poisonous, and if they get through or into the skin prove very annoying. I once crushed one of these pretty caterpillars in endeavoring to brush off one which was crawling on the back of my neck; the hairs were thus forced into the skin, and caused, as the result, the skin to smart severely for forty-eight hours."

† "Walk along any of our streets where the trees are placed on the edge of the sidewalk and notice the effect due to our general negligence. In some instances you will find that the house-owners have placed guards around the trunks, and the trees



EXAMPLE OF TREE GNAWING.

After an investigation into the many contrivances for the protection of the trunks of shade trees, a simple form of guard has been adopted. In the case of the large trees, it consists merely in wrapping a wire netting about the base of the tree and securing it with a few wire staples. The wire netting used, is made of galvanized iron wire six feet wide, of one inch mesh and made of the heaviest wire, or what is known in the trade as number fourteen. In the case of newly-planted young trees, the arrangement is somewhat different. With every young tree planted upon the sidewalks, a stout spruce pole is also planted. The tree is securely tied to this pole by a rope which passes through a piece of old rubber garden hose about six inches in length and so fixed that the trees cannot chafe against the pole. Then the six-foot wire netting is cut in strips of about twenty-four inches, and one of these strips is neatly coiled around the tree and pole. A few wire staples secure the netting to the pole and the cylinder of netting thus made is large enough to be free from the tree at all points. This form of guard has the advantage of being the least expensive and the least conspicuous of anything which has been used, and it is believed that it will afford sufficient protection to the trees. Such a guard might be placed, without a very great total expense, upon every public tree in the city.

THE NURSERY.

Nothing very satisfactory could be accomplished in street tree planting if the department were to purchase each lot of trees from the market as they are wanted. Aside from the cost, which is a very important consideration, it is not possible to get uniformity in size and appearance by purchasing merely as needed for immediate work. One of the principal causes of failure among trees planted on streets in towns and cities is the unsuitableness of the trees chosen. To take trees which have been gathered from a variety of sources by nursery-

are symmetrical and have attained a good size. But in most cases, they have been left to take care of themselves. Bright and early the milkman comes along and jumps off with his can, leaving his horse to make a scanty breakfast by gnawing the bark of the nearest tree. Later on come the butcher and the grocer, whose horses lunch upon what was left by their predecessors, inflicting an amount of damage to the tree limited only by the length of time which their owners are pleased to spend in conversation with the girls in the kitchen. Last of all comes, perhaps, the doctor, whose visits, if they are not frequent, are proportionally long. He, at least, ought to know that trees cannot be wounded with impunity. No wonder that the bark is not only soon removed and the wood exposed, but since the horse is an animal which prefers the softer bark to the harder wood, the fresh borders of the wound are repeatedly attacked until deformities of enormous size are produced, and apart from the danger of fungus growths, the nutrition of the tree is seriously deranged. A visit to Oxford street, Cambridge, where on one side of the street the trees have not been protected, and wounds more than two feet long have been made by horses, will show that I am not exaggerating. If I mention this particular street, it is because I have to pass through it every day. Other equally bad instances might be named." From Prof. William G. Farlow's pamphlet on "Diseases of Trees Likely to Follow Mechanical Injuries," a treatise which might be read with profit by every Cambridge citizen.

men and plant without discriminating as to size or habit, is not the way to get good results.

The nursery which was established this spring upon a portion of Rindge Field has enabled the department to purchase tree stock in a much more economical way than has hitherto been the case in this city. By buying in lots and planting what was not required for immediate street work in this nursery, trees have this year cost about one-half the former prices and much better stock has been obtained. A considerable amount of younger stock has also been purchased at prices ranging from \$5.00 to \$15.00 per hundred, and this stock will cost nothing further until in three or four years it is ready to plant upon the streets and park driveways. The soil upon Rindge Field is excellent for the purpose, and the portion set apart for the nursery does not interfere with the enjoyment of the main field by the public.

The following trees are in the nursery at the present time : —

| BOTANICAL NAME. | COMMON NAME. | NUMBER. |
|---|----------------------------|---------|
| <i>Acer dasycarpum</i> | Silver leaved maple..... | 111 |
| <i>Acer platanoides</i> | Norway maple..... | 163 |
| <i>Acer saccharinum</i> | Rock maple..... | 145 |
| <i>Fagus ferruginea</i> | American white beech..... | 9 |
| <i>Fagus sylvatica</i> var. <i>cuprea</i> | Copper beech..... | 6 |
| <i>Fraxinus Americana</i> | White ash..... | 202 |
| <i>Platanus orientalis</i> | Oriental plane..... | 200 |
| <i>Pyrus aucuparia</i> | European mountain ash..... | 10 |
| <i>Quercus rubra</i> | Red oak..... | 994 |
| <i>Quercus macrocarpa</i> | Burr oak..... | 180 |
| <i>Tilia Americana</i> | Linden..... | 214 |
| <i>Ulmus Americana</i> | American Elm..... | 263 |
| Total..... | | 2497 |

CAMBRIDGE COMMON.

However beautiful and satisfying the proposed parks of the new system may become in future years, they will never be held in the same spirit of veneration by Cambridge people, nor be sought with the same interest by visitors, as is Cambridge Common. This muster-field of the American Army of the Revolution is priceless ground. While no adornment can enhance its value in the eyes of Cambridge people, the proper care of this sacred ground has now become one of the chief duties of this department.

It must be admitted that the present treatment of Cambridge Common is a decided failure, from any artistic point of view; but it is certain that no radical change in the ground plan would be tolerated by the people. All the associations of this historic spot are of

“ That wild where weeds and flowers promiscuous shoot,”

And although the turf and trees are now carefully trimmed and the

walks kept clean, the homely character of a New England common still remains. It would, indeed be inappropriate to bedeck this ground with ornate designs, in the attempt to produce fine effects, even if a sufficient appropriation could be secured for the purpose. But while this is not to be desired, certain improvements may be made at no great expense, which would, doubtless, meet the approval of everybody.

The present condition is the result of no plan whatever. Thus, while the Common has been jealously guarded against any efforts of the landscape artist to beautify it, it nevertheless contains the most pretentious monument to be found in all the city. It is difficult to harmonize this pile of masonry with its formal lines, with the idea of a quiet village green, such as a common is supposed to be. This, however, is the present condition of things and must be accepted.

The formal flower beds which surround this Soldiers' Monument, might well be dispensed with. The effect of a monument of this size, rising from a bed of flowers is not artistic. We might, with good results, adopt Mrs. Van Rensselaer's suggestion in a similar case. She writes: "Nothing is more beautiful than the way in which the French use ivy to drape the pedestals of their open air statues; and even when these stand, as I think they should not, in the centre of open lawns, the mistake is partly condoned by the unifying creepers. So far as I remember, the French never surround a statue with a high growth of loose-leaved ornamental plants or a wide pattern-bed of flowers. The distinction between right and wrong methods of treatment is, in this case perfectly clear. The creepers unite themselves with the monument and unite it with the ground, while the big foliage-plants or pattern-beds supply a third element which has no intimate relationship with either turf or stone. . . . The stone work should be draped, not wholly concealed, and for such a purpose the so-called Japanese ivy is an excellent plant. It looks as though nature had invented it to serve the architect's needs. Although it loses its leaves in winter, even then its beautiful network of delicate branches seems to tie the stone on which it clings to the bosom of Mother Earth."*

Mr. Sylvester Baxter in an article published in *Garden and Forest*, discussing the service which climbing and clinging plants render in city decoration, makes the following interesting suggestion:

"The value of trailing growths for fences is not appreciated in this country as it should be. In Germany the Virginia creeper is put to simple and effective use for this purpose in urban public grounds. A light, low fence is made of stakes and connecting wires; the Virginia creeper is trained up each stake and made to form graceful festoons between. Its employment in some fashion would do good service on a place like the Cambridge Common, for instance, now a bare, unattractive expanse, having a sort of kinship with the New England rustic burying ground. It is surrounded by a fence composed of unhewn

*From Mrs. Schuyler Van Rensselaer's "Art Out-of-Doors."

granite posts with squared rails of wood between. Virginia creepers, Japanese ampelopsis, and perhaps other twining or climbing plants, might convert this old fence into a thing of beauty."

These are some of the improvements which might be made without violating the traditional treatment of the common. In addition, some superfluous trees should be removed, some oaks planted, and an attempt made to provide more nourishment for the roots of the trees which are now suffering for the want of better soil. The opinion held by some, that it is impossible to grow large trees on the common is met by the answer that it has been done in the past, as the following evidence, submitted by ex-Mayor Bradford, seems to prove:—

CAMBRIDGE, November 17, 1894.

MR. GEORGE R. COOK,

General Superintendent of Parks;

DEAR SIR:—It is with pleasure I respond to your request to write out the information given me by the late ex-Mayor James D. Green, regarding a former wooded growth upon the Common in Ward One, which, briefly stated, is as follows:

Riding in the same carriage with Mr. Green on the occasion of our City Government's visit to Lexington, in 1875, to attend the centennial celebration of the battle of April 19, that gentleman, as we were passing the Common, mentioned to me that his father had told him: "That immediately after the fight at Menotomy, a large body of minute-men rallied upon the Cambridge Common and the weather turning cold, foraging parties were ordered to cut down the heavy timber which then grew upon the spot, for the purpose of maintaining camp-fires. The stay of the militia having lasted until the march to Bunker Hill, two months later, nearly all the trees were felled, with the exception of the Washington Elm, and two or three other large elms which are still standing in the sidewalk upon the east side of North avenue in the vicinity of Jarvis street."

The presence of other large trees in Old Cambridge, notably on Linnaean and Brattle streets, suggests their having been a part of this same pristine forest growth; as, "until 1720, the 'Common' extended to Linnaean street." *Vide*:—Page's History, p. 217.

Yours very truly,

ISAAC BRADFORD.

The following record of correspondence, opens an interesting question. It is hoped, in the spring, to carry out the plan mentioned, there in:—

NOVEMBER 6, 1894.

Hon. Chas. S. Saunders:

DEAR SIR:—Dr. Walcott tells me that you have some interesting facts regarding an oak tree which formerly stood on Cambridge Common, and which was associated with Sir Harry Vane. I would like, very much, to get these facts, with the view of planting an oak tree in the same spot if this be possible.

Will you kindly communicate with me as to this, and greatly oblige,
Very respectfully yours,

G. R. COOK,
General Supt. of Parks.

NO. 5 NO. AVENUE, CAMBRIDGE, }
November 9th, 1894. }

George R. Cook, Esq., Supt. of Parks:

DEAR SIR:—Your favor of November 6th is received. For several years after the settlement of Cambridge, the annual election of the Colony for the choice of Governor and his assistant and other officers was held in this town. The people assembled under a large oak tree, which stood on the north side of the common, and the voting there took place. In 1637 the contest for Governor was between Gov. Henry Vane and ex-Gov. John Winthrop and it was very exciting. During the uproar before voting, Rev. John Wilson, minister of the first church in Boston, climbed into this tree and made a violent appeal for Mr. Winthrop, after which the meeting voted to proceed with the election, and John Winthrop was elected over Gov. Vane, and the latter shortly after left New England and sailed for Old England.

As we are largely an historic city, this spot, which can be located very closely, I think should be marked by a granite tablet, and an oak tree planted thereon. It will always be interesting to know where the early settlers of Cambridge held their elections in the days of small things, and coming generations will appreciate all such localities.

Yours very truly,

CHAS. H. SAUNDERS.

DANA SQUARE.

The reservation known as Dana square was given to the city in 1856 by Edmund Trowbridge Dana, upon the condition that the city should grade the streets around the same, erect a suitable fence, ornament it with trees and forever occupy it as a public park. The gift was accepted by the City Council and at the same time an effort was made, to induce them to purchase about 50,000 feet adjoining, and thus extend the park to Pearl street. This effort was unsuccessful, but subsequently the city purchased a portion of the land lying between Niagara and Pearl streets, and erected the Willard school-house thereon. Probably nearly every one now regrets that the effort of 1856, to secure an adequate park area in this vicinity, was not successful.

It is not yet impossible, however, to carry out a large part of this plan, even without any further expenditure for the purchase of land. If Niagara street (which is bounded by city land upon both sides its entire length) were closed, and the high board fence around the school-house lot removed, the present area of Dana square would be doubled. The Willard school now stands in the midst of a barren gravel lot. Under these new conditions, with the turf area extended from Magazine Street to the rear of the school lot, with trees and walks artistically arranged, and with the walls of the schoolhouse partly concealed by creeping vines, one of the most charmingly situated primary schools in all New England might be secured.

During the past year, considerable work has been done to improve the appearance of Dana square, and although the result is yet far from being satisfactory from an artistic point of view, much has been

accomplished. The money available did not warrant any radical change in the ground plan. The straight gravel walks running with painful accuracy from corner to corner were, therefore, allowed to remain, but at the point of intersection in the centre, these lines were broken by a circle in which was massed a planation of shrubbery. The broad walk which divided the square into two narrow rectangles was removed, and that amount of area was rescued from gravel to grass. Seven ill-shaped Ash trees and one superfluous and deformed Elm tree were removed. In the part of the square most remote from Magazine street, conifers were planted in groups and singly.

It was found necessary to build a light fence of wire along the borders of the paths to keep the children from heedlessly running upon the turf. Groups and borders of shrubbery have been planted with the idea of hiding, to some extent, these fences. Liberal use has been made of the Japanese Barberry (*Berberis Thunbergii*) which adds to its many good qualities as a decorative plant, the merit of being able to protect itself from juvenile despoliation, by a plentiful supply of thorns.

The repair of the iron fence, the resurfacing of the walks, and the resodding of a portion of the area, are other improvements which have been made.

BROADWAY PARK.

The public reservation upon Broadway in Ward Two, commonly called Broadway Park, has been anything but a source of pride to the General Superintendent this year. And yet, under the existing conditions, it was not possible to make any improvement. This reservation consists of 107,181 square feet of land, and upon it are 131 trees of various kinds and conditions of growth. A thin covering of loam, averaging about four inches, is spread over the sandy subsoil. The place is frequented by crowds of children and there has been no attempt made to keep them off what little grass grows there. It is by far the most popular playground for small children in the city, and as an open-air nursery for infants it is much used by the mothers and nurses of the neighborhood.

These facts suggest the improvements which should be made in this park. If the plan for its reconstruction already prepared by Messrs. Olmstead, Olmstead and Eliot, is carried out, we shall have in this reservation one of the most delightful little retreats for the children from the dust and danger of the streets, in all the city. If a sufficient quantity of good loam is provided, (the depth should be from eighteen to twenty-four inches), and an adequate system of irrigation is also provided, it is believed that a turf can be maintained upon the park, upon which it will not be necessary to raise the sign to "keep off the grass." The luxury of a bit of rich greensward in the centre of the city, which "neither grows yellow under children's feet, nor green over their

graves," is worth all that it will cost, and will be an agreeable change from former conditions.

This land has been owned by the city since 1812. In that year it was purchased from Jonathan L. and Benjamin Austin for the sum of \$791.67. It was used as a burying ground until 1865, when, by a resolve of the Legislature, it was set apart as a public park, it being provided that "Said ground shall be surrounded by suitable enclosures, and shall forever remain unused for a public street, unoccupied by any buildings, and open as a public park."

It does not appear that it was ever formally named, and common usage has been divided between "Broadway Common" and "Broadway Park." Both names are meaningless, and with the new treatment, should be given a new and more appropriate name.

In anticipation of the reconstruction of the park, about 325 cubic yards of loam have already been stored there, the purchases having been made from the regular appropriation for public grounds of this year. If the special appropriation is granted by the City Council, the work of reconstruction can be completed at an early day.

HASTINGS SQUARE.

It has often been remarked that Hasting square is the most satisfying of all our old public reservations. Upon inquiry we learn that the satisfaction arises from the fact that this reservation contains an abundance of vegetation. And, yet in Hastings square, neither nature nor art prevails. Nature does not crowd specimen trees and shrubs from all over the earth, into one small lot, and art has some thought of form, texture, color, and general effect. Yet, there is no denying that this little spot where "rare" and eccentric trees crowd against ill-shaped native trees to reach the light, and where an undergrowth of shrubs covers what might be turf, that even this tangle and confusion of vegetation is a source of delight to many people during the summer months. The entire absence of any general plan is not noticed by those who find pleasure in "something green." All this is suggestive to those whose duty it is to build parks, and should caution them not to go too far from the average tastes and desires of the people.

Yet Hastings square can be improved without robbing it of its green. A little kindly pruning, and some transplanting would bring about a change which all would agree was for the better.

DR. PAIGE'S SUGGESTIONS.

The following letter from the venerable Lucius R. Paige, D.D., L.L.D., is the result of a conference held at his invitation. The letter contains his recommendations concerning the renaming of Winthrop square and also the naming of the reservation commonly called Broadway Park, together with the reasons therefor:—

To the Park Commissioners of the City of Cambridge.

GENTLEMEN:—In compliance with the request of the General Superintendent of Parks, I repeat my suggestions heretofore made verbally concerning a new naming of Winthrop Square and Broadway Common.

The name Winthrop Square is comparatively modern. In the Proprietors' Records, 1635, it is stated that this lot, originally designed for individual use, "is now to be entered as the Market Place." After retaining this name about two hundred years, the selectmen were authorized, April 7, 1834, "to permit Market Place, so called, to be enclosed, as they shall judge for the ornament and benefit of the town and the petitioners." Not long afterwards, and within my personal recollection, a general renaming of streets was made, when, among others, First Parallel, Second Parallel and Third Parallel streets in Ward Four became respectively Green, Franklin and Auburn streets; and probably at about the same time Market Place became Winthrop Square, and Long street took the name of Winthrop street. By this change a double honor was assigned to a very honorable man, instead of dividing it between him and another, who was generally regarded as almost if not quite as honorable, and who certainly had rendered much more important service to Cambridge, namely, Thomas Dudley, the founder and early guide of the infant settlement.

As I have stated, more at large, in the "History of Cambridge," pages 6 and 7, the Governor and Assistants agreed Dec. 28, 1630, that they would "build houses at a place a mile east from Watertown, near Charles river, the next spring, and to winter there the next year." But it does not appear that any of them fulfilled this agreement except Dudley, and Bradstreet, who married his daughter. Governor Winthrop indeed erected a house, but very soon took it down again and removed it to Boston, for which he afterwards "acknowledged himself faulty." But Dudley, with his son Samuel, and Bradstreet and Denison, who had married his daughters, remained here until the general exodus of Hooker and his church to Hartford; during which period, he used all reasonable exertion for the prosperity of the New Town. But no permanent memorial of him exists in Cambridge, except a tablet in Dunster street, near his homestead, and a street recently opened in Ward Five.

I may add, that during his whole life in New England, and even before the colonists left their native home, he was a public officer. First selected an Assistant in England, he held that office eight different years; he was Deputy Governor thirteen years, Governor four years, Commissioner of the United Colonies three years, and twice President of that Board.

Under such circumstances, it seems reasonable that the old Market Place should be called Dudley Square, while the street on its southern border retains the name of Winthrop, so that, like the Rocks in Bedford, called by Winthrop, the Two Brothers, they may perpetuate the reconciliation and friendship of these two men after a serious controversy.

In regard to Thomas Danforth, I do not hesitate to say that, in my judgment, he was the most eminent man who has been a permanent resident in Cambridge. His long life was almost wholly devoted to the service of the town, the college, and the colony. He was a Selectman, 1645–1671, twenty-seven years; Town Clerk, 1645–1869, twenty-five years; Representative (or Deputy,) 1657–1658, Assistant, 1659–1678, twenty years; Deputy Governor, 1679–1692, except during the usurpa-

tion by Andros, and probably nothing but a tender regard for the old age of the venerable Bradstreet prevented his election as Governor. With the same exception, he was President of the District of Maine 1681 to 1692, twelve years. Under the Second Charter he was member of the Council, 1693-1699, (when he died,) and Judge of the Supreme Court. He was Treasurer of Harvard College, 1650-1669, twenty years, and Treasurer of the County many years; Register of Deeds, and Clerk of the Courts, 1648-1686, thirty-nine years. He was also Commissioner of the United Colonies at every session from 1662 to 1678, and President of that Board in 1675.

In the political field, he was unquestionably the leader of the party in opposition to the British Parliament in regard to the old Charter. With reference to that long and severe struggle, Palfrey well says that Bradstreet, in his old age, could not be considered "equal, either in ability of mind, or in force of character, to the task of steering the straining vessel of the State in those stormy times. More than any other man then living in Massachusetts, Thomas Danforth was competent to the stern occasion." (*History New England*, III., 332.)

Strange as it may seem, notwithstanding his important and long continued services to the town as well as to the Colony, no public memorial of Mr. Danforth exists in Cambridge, except the tablet erected in 1882, near the western corner of Kirkland and Oxford streets to designate his place of residence. It may reasonably be hoped that his name may not only be given to the Broadway Common but also perpetuated hereafter by some more conspicuous token of remembrance. Respectfully submitted,

LUCIUS R. PAIGE.

CAMBRIDGE, Nov. 13, 1894.

WINTHROP SQUARE.

The attention of the whole city has, this year, been turned to Boylston street and Winthrop square, and the opportunities for the development of this historic neighborhood into valuable residential and business property are becoming appreciated. The demand for an improvement in the appearance of Winthrop square will be strongly urged this coming year, and cannot well be ignored by this department. No plans have yet been prepared for its treatment.*

* "The care of these small squares is often difficult on account of the crowds that congregate or pass through, and on account of the heat and dust, but it can be done by continual watering, cleaning and cultivating. Canal Street Park, New York, is situated in perhaps the most difficult position in the city of which it is possible to conceive. The surrounding houses are tenements, produce stores, and the like, and the incessant traffic consists largely of trucks and carts, laden with coal, refuse, vegetables, and the roughest material. Dirt is ubiquitous, and the heat at times is great. And yet the grass is always green here, and the shrubs, trees, and bedding plants always thriving. The park is only 195 feet long by 69 feet wide, but it occupies the entire attention of one gardener, and two police officers, either one of whom is on guard at night and during the day. It is a pleasure to see the mothers with their children gather here on the settees throughout the long sultry summer nights, and realize that this unspeakable boon can be secured at such comparatively low cost. Every city should seek to adorn these small greens, to increase their number, and to enlarge their boundaries."—*Samuel Parson, Jr.*, in "*Landscape Gardening*."

FORT WASHINGTON.

This historic field is situated in an obscure part of the city and has, of late years, been given over to the rough sports of men and boys. An occasional raking of the grass, is all that the department has attempted to do upon this reservation this season. Complaints are heard from time to time of the city's neglect of these grounds. A proper care, would, however, be expensive, owing to the situation, and the almost entire lack of police protection, and therefore not possible under the present appropriation.

THE CITY HALL GROUNDS.

Much credit is due to the head gardener, James Doherty, for the well-kept lawns and tasteful arrangement of the flower-beds around City Hall. The exceptionally dry season, and the inadequate supply of water from the hydrants have been unfavorable conditions, but extra care has resulted in keeping a luxuriant turf throughout.

During the year, the treatment of these grounds has been a matter of public discussion. An art critic in one of the metropolitan dailies pointed out that the present terraces "are formless, and consequently weakening in their effect upon the broad mass of the noble facade that rises therefrom." This writer suggested that "it would require no extravagant expenditure for the construction of a suitable terrace, which would form a firm and dignified basis for this fine municipal building and greatly enhance its already stately effect."

As another contribution to this discussion the following letter was received:—

LONGFELLOW, ALDEN & HARLOW,
ARCHITECTS.

6 Beacon Street, Boston, Mass.

BOSTON, October 23, 1894.

George R. Cook, Esq., Superintendent of Parks, Cambridge City Hall,
Cambridge, Mass.

DEAR SIR:—I consulted Professor Sargent on his return, and we came to the conclusion that the best effect as to planting around the City Hall could be gained by keeping shrubs like lilacs, on the upper terrace, as close to the building as possible, so as to remove the hard effect of the stone rising directly from the ground, and the trivial effect of decorative plants and flowers. I should recommend that it be massed firmly on the corners and at the points of the terrace where the steps descend from the platform. This planting, we think, should be irregular in masses and plan, and rather overhanging the first terrace from which the building rises.



Tree on Ellsworth Avenue rendered dangerous by change in street grade and placing the curbstone.

The most important thing would be to get rid of the secondary terrace which lines with the second run of steps. This, as you will see by consulting our original drawing of the hall, was not intended, as we wanted a retaining wall all around the building and the steps leading from the bank to the sidewalk.

Nothing would help the building so much as to carry out this original idea of a bank wall, so that we might have a calm slope from the upper steps to the lower steps and sidewalk, and do away with that intermediate terrace, which has no definite beginning or end or *raison d'être*, except as necessitated in order to save money on the wall and filling.

Mr. Baxter, in the *Herald*, of last Sunday, has again written on the subject. Professor Sargent thinks the ground might well be prepared and the planting best done in the spring.

I should, of course, be interested in talking this matter over with you, and also most interested in any scheme to return to the original design for the terrace.

If you have no print of our original perspective drawing, I should be glad to send you one.

Very truly yours,

A. W. LONGFELLOW, JR.

The matter now rests at this point. It is introduced in the report, that a record may be made of these valuable suggestions. The spring may afford an opportunity to change the present planting effects somewhat.

THE LIBRARY GROUNDS.

But few changes have been made upon the grounds around the Public Library. The care of the grass, flower-beds and shrubbery occupies a considerable part of the whole time of the gardeners during the season ; but the work is warranted by the results attained.

PARK MANNERS.

It is a curious fact that immediately upon the announcement that Rindge Field, Cambridge Field and the lands along the river had been taken by the city for park purposes, and were no longer private property, the public, especially the younger portion, assumed a different attitude toward these places. Lawless and destructive acts have since been committed in localities heretofore exempt, with a frequency which shows that in the minds of some people there is an unfortunate distinction between private and public property. The same fact has been painfully evident in the use of the old commons and squares. Many instances have been noted where children have passed by flower beds upon private grounds, only to pluck freely or wantonly destroy the blossoms and plants belonging to the city. It is to be regretted that children thus learn to make a fallacious distinction between property which is a private and property which is a public possession.

The mischievous destruction of the public plantings by juvenile offenders can, of course, be checked by a vigorous police policy. But this is a crude and altogether unsatisfactory way to teach a proper respect for the beautiful things which are a common possession. Park manners must be taught in a more rational way. By simple lessons, applied in the right way and at the right place, children may be taught how to appreciate and enjoy the parks, and as the parks are being built and laid out into places of beauty, a generation may be prepared who shall know how to use, but not abuse them.

Indeed, when we consider the present conditions which surround child-life in Cambridge, it seems remarkable that the youthful generation has any notion at all as to the proper use of public reservations. The child's first experience with municipal or public matters is at the public school. At the public school the conditions for the cultivation of park manners is about as unfavorable as could well be imagined. The grounds which surround the average school house in Cambridge are among the most desolate and uninviting places in all the city. They are spaces of sand and gravel upon which vegetation could not possibly thrive, and are hidden from the outer world by high and close board fences. From these little Saharas, only the manners of a Bedouin could reasonably be expected to come.

The last twenty-five years have witnessed a marvellous improvement in the interior accommodations of our school houses. And this improvement in the furniture and appliances has resulted in a corresponding improvement in the attitude of the children toward these things. But in the grounds surrounding these school houses, there has been no improvement whatever. The neglect has been remarkable.*

Elegant brick buildings have been designed by competent architects, have been erected at large cost, and have been handsomely furnished. But the grounds have been merely cleared of the carpenter's shavings, and then left,—barren heaps of gravel. The Morse school house is, perhaps, the best, but not the only illustration of this curious condition of affairs.

If low and open fences or stone curbs were placed around these school-house grounds, enclosing but not hiding well-kept lawns, and climbing vines were trained upon the brick walls of the buildings, and shade trees were planted, there is every reason to believe that the school children would become enthusiastic in their loving devotion to these little parks, and the Bedouin spirit of lawlessness would disappear. Eden and not Sahara was the early home of the race, and it is a

* "A man shall ever see, that, when ages grow to civility and elegance, men come to build stately sooner than to garden finely; as if gardening were the greater perfection."—*Bacon*.

perversion of human nature which leads children to treat beautiful objects of nature with anything but loving care.*

The abolition of the school recess is a favorable condition in the improvement of the school house grounds. The grounds are no longer used for recreative purposes, and, therefore, may properly be devoted largely to decorative purposes.

Under the ordinance which places all "enclosures" under the care of the Park Department, the work of cultivating these school house grounds belongs to this department. The only reason that more of this work has not been done this year, is lack of an appropriation. In the single instance of the Wyman school, which is situated upon park land, decided improvements have been made, and furnish an illustration of what may be accomplished upon all the school grounds.

The table upon the following page shows the present condition of the grounds of all the school houses in the city.

* "It does not require an analysis of phrases, such as 'to the manor born' or 'love at first sight,' to make us realize that noble surroundings reflect themselves in manners, or that a sense of beauty accompanies association with it. The recognition of such trite statements as these is so universal, so axiomatic, that the failure of the public to act in accordance with the facts is the more amazing. . . . But the school still remains a factory for education. Those of us who have seen Rugby and Harrow, or have visited the board schools of the smaller English towns, such as Chester or Leamington, remember the fascination of the ivied walls and porches, the long mullioned windows, the oriels and gables, and the surrounding lawns and closes of an English school. And with the pleasure of the memory is mingled the regret that no such association clings to the American school, which is bare and forbidding, set in a waste of gravel, serving the purpose as a shelter, and always kept at an equable temperature. These things we recall, but never can the municipal schoolhouse of America form the background for a Tom Brown. Yet the boy is at his most impressionable age during the years in which he is studying within the walls of the modern school; his hours of work and his time for recreation are influenced by its vicinity, and for eight months of the year at least one-half of his working hours have this school for their setting."—*Suggestions on the Architecture of Schoolhouses*: C. Howard Walker. *Atlantic, Monthly*, vol. 74.

"We have an ideal picture, that refreshes our imagination, of common school-houses, scattered all over our wide country; not wild bedlams, which seem to the traveller plague-spots on the fair country landscape; but little nests of verdure and beauty; embryo arcadias, that beget tastes for lovely gardens, neat houses, and well cultivated lands; spots of recreation, that are play-grounds for the memory, for many long years after all else of childhood is crowded out and effaced for ever."—*A. J. Downing*, 1848.

| NAME. | LOCATION. | AREA OF LOT IN SQ. FEET. | KIND OF BUILDING. | CONDITION OF THE GROUNDS. |
|----------------|-------------------------------------|--------------------------------|----------------------|---|
| Latin..... | Fayette, cor. Broadway..... | 37,891.0 | Brick. | Grass and trees in front, with open iron fence. Close board fence and no cultivation in rear. |
| English High.. | Broadway, cor. Trowbridge..... | 37,827.7 | Brick. | No fence; well kept walks. |
| Wellington.... | Columbia, near Cambridge..... | 27,622.0 | Brick. | Gravel; no cultivation. High and close board fence. |
| Allston..... | Boardman, near Broadway..... | 15,932.2 | Brick. | Brick pavements; vines. Open iron fence in front. |
| Corlett..... | Holworthy street, Belmont district. | 10,000.0 | Wood. | Gravel and some grass. Close board fence. |
| Harvard..... | Inman, cor. Broadway..... | 20,494.4 | Brick. | Brick pavement; trees and vines. Open iron fence. |
| Morse..... | Allston, cor. Brookline..... | 26,134.0 | Brick. | Gravel; no cultivation. No fence. |
| Peabody..... | Linnaean, cor. Avon..... | 21,813.0 | Brick. | Grass, trees and vines. Curb in front. High and close board fence on sides. |
| Putnam..... | Otis, cor. Fourth..... | 10,065.0 | Brick. | Building on street line. No cultivation. |
| Shepard..... | No. Ave., near Russell..... | 14,755.0 | Brick. | Brick pavements. Open iron fence in front. |
| Thorndike..... | Thorndike, cor. Sixth..... | 10,027.5 | Brick. | Brick pavements; no cultivation. High and close board fence. |
| Washington.. | Brattle, near Church..... | 14,951.5 | Brick. | Brick pavements; flower beds and trees. Open iron fence in front. |
| Webster..... | Upton, near Magazine..... | 25,839.6 | Brick. | Grass. Open wooden fence on part of the front. High and close board fence on sides. |
| Agassiz..... | Sacramento, cor. Oxford..... | 19,688.7 | Brick. | Gravel; no cultivation. High and close board fence. |
| Boardman.... | Winsor, near Main..... | 10,018.0 | Brick. | Gravel and some grass. Shade trees. High and close board fence. |
| Cushing..... | Cushing street, Belmont district... | 14,789.4 | Wood. | Gravel; trees. Open fence in front. |
| Dana..... | Centre street..... | 14,317.0 | Wood. | Grass in front with open iron fence. Gravel and high and close board fence in rear. |
| Dunster..... | Concord ave., near Sparks..... | 10,000.0 | Wood. | Gravel and shade trees. High and close board fence. |
| Felton..... | Amory, near Broadway..... | 15,090.0 | Brick. | Some grass and shade trees. Open wooden fence in front. |
| Gannett..... | Jefferson, near Cambridge..... | 8,802.7 | Wood. | Brick pavements; no cultivation. |
| Gore..... | Gore, near Third..... | 10,675.0 | Brick. | Gravel, small trees; no grass. High and close board fence. |
| Holmes..... | Hilliard, near Brattle..... | 11,182.0 | Wood. | Gravel; no cultivation. High and close board fence. |
| Lassell..... | Charles, near Sixth..... | 10,000.0 | Wood. | Gravel, no cultivation. High and close board fence. |
| Lowell..... | Lowell, near Mt. Auburn..... | 12,033.0 | Wood. | Brick pavements; 1.0 cultivation. High and close board fence. |
| Otis..... | Otis, near Fifth..... | 8,270.5 | Brick. | Gravel; no cultivation. Open wood fence. |
| Parker..... | Broadway, cor. Sixth..... | 12,319.0 | Brick. | Gravel and some grass. High and close board fence. |
| Quincy..... | Mason, near Garden..... | 8,469.3 | Brick. | Gravel; no cultivation. High and close board fence. |
| Reed..... | Reed, near Spruce..... | 12,000.0 | Wood. | Gravel; no cultivation. High and close board fence. |
| Riverside.... | Putnam ave..... | 11,198.8 | Wood. | Gravel; no cultivation. High and close board fence. |
| Sargent..... | Broadway, cor. Winsor..... | 9,995.1 | Wood. | Gravel; no cultivation. High and close board fence. |
| Stearns..... | Harvard, opp. Essex..... | 10,080.5 | Wood. | Some grass. High and close board fence. |
| Tarbell..... | Howard, near West-ern ave..... | 19,500.0 | Wood. | Gravel; no cultivation. High and close board fence. |
| Willard..... | Dana sq., Magazine..... | 20,079.0 | Brick. | Grass in front. Low and open fence. |
| Wyman..... | Spruce, near North ave..... | 14,346.8 | Wood. | |
| | | 535,488.7 | | |

It will be seen by the foregoing table that the city owns about 12 1-4 acres of land which is devoted to school purposes. Deducting the area occupied by the school houses, there remains an amount of land about as large in the aggregate as Cambridge Common, scattered about the city near the homes of the people, and most of it now entirely neglected. Undoubtedly, it would be a good business investment for the city to cultivate and beautify these spaces. If a railroad corporation finds it profitable to decorate the grounds around its stations which are for the most part in the poorest parts of the towns through which the railroad passes, then a city can at least afford to cultivate the school reservations in the midst of the homes of its people.

CAMBRIDGE FIELD.

On November 30, 28,266 filling tickets had been issued on Cambridge Field, each ticket representing one double load of filling material delivered. There had also been delivered 919 double loads of loam. Planting spaces, 60 feet long and 10 feet wide have been prepared along Cambridge street to the number of six, and on Berkshire street, four and on Willow street four have been prepared. These spaces hold loam to the depth of 2 feet, with a thin layer of street-scrappings beneath to hold moisture.

Curbstones have been laid on Willow street 400 feet, and on Berkshire street 390 feet, with circles at the corners of Cambridge street. The entrances to these two new streets have also been paved. This work has been done by the department, the pavers being transferred from the street department, for the purpose. The following order was adopted by the City Council: —

| | |
|---------------------|---|
| CITY OF CAMBRIDGE, | } |
| IN BOARD OF ALDEMEN | |
| September 18, 1894. | |

Ordered: That the Park Commissioners be and are hereby authorized to occupy and improve that portion of the southerly side of Cambridge street between Berkshire street and Willow street, now used as a sidewalk, as by said Commissioners may be deemed best in the perfecting of their plans for the laying out of the so-called Binney Field for a public park.

Concurred, Sept. 18, 1894. Approved, Sept. 19, 1894.

The foundation of most of the interior walks on the field has been laid, and these walks will be ready for the top finish in the early spring.

Provision for an adequate supply of water for public parks is a matter often neglected and the grass and plantings suffer in consequence. In the plan for irrigating Cambridge Field, a full water supply will be provided. The plan includes 18 three-quarter-inch and one four-inch hydrants, so placed that no part of the cultivated portion of the field will be more than 100 feet distant from one of them. The pipe necessary to supply these hydrants will amount to 1950 feet of one-inch, 1230 feet of

two inch and 720 feet of four-inch. Of this, 786 feet of one-inch and 228 feet of four-inch have been laid. With such a plant beneath the surface a very small amount of garden hose will be required and the vegetation upon all parts of the field may be quickly watered by a small force of men.

The plans for draining the field call for 700 feet of ten-inch drain pipe, 180 feet of eight-inch and 128 feet of six-inch, all of which have been laid except 340 feet of ten-inch pipe. There will be 5 catch basins in the field, one of which has been built.

The trees selected for the field are the Oriental Plane (*Platanus orientalis*). These have been purchased, and 200 fine specimens are now in the nursery ready for planting in the spring.

Respectfully submitted,

GEORGE R. COOK,

General Superintendent of Parks.

REPORT

OF THE

LANDSCAPE ARCHITECTS.

MR. HENRY D. YERXA,

President of the Park Commission, Cambridge, Mass.

DEAR SIR:—You have asked us to make a report of our relations to the work of the Cambridge Park Commission. Permit us to make answer by transcribing from our files the following papers: 1st, a note about Fresh Pond dated October 16, 1893; 2d, a letter dated December 9, 1893, treating of the general problem of parks for Cambridge; 3d, certain notes dated January 11, 1894, briefly describing the preliminary sketch plans for the reservations then temporarily named "Cambridge Field," "Rindge Field," "The Front," "The Esplanade," and the "Charles River Drive;" 4th, a summary of the argument for a dam in Charles river; 5th, notes on a plan for the remodelling of Broadway square; 6th, a list of the principal drawings made in our office for the consideration of your Board

I. LETTER ABOUT FRESH POND, OCTOBER 16, 1893.

In the course of our recent study of the problem of selecting sites for public grounds in Cambridge, you drew our attention to the large existing reservation which surrounds Fresh Pond. The total area of this reservation is 337 acres, of which about 155 acres are water. Because of the closely-built character of the city and the narrowness of the municipal limits, this is the largest open space Cambridge can ever hope to possess. Its primary purpose is the safe storage of water, but the reservation has already been in a measure dedicated to the additional purpose of public recreation and called a 'park.'

As we viewed the place the other day and perceived the beauty of the natural setting of the pond among the hills, and the incongruously stiff lines of the engineer's work about the shores, it struck us that it was time the people of Cambridge determined in what way their one large reservation might best be made to contribute to their recreation

and refreshment. Does a large public reservation yield to dwellers in cities the greatest possible return when it is planned on lines as formal as those of city streets? Does it not rather return its greatest dividend of benefit only when it is made as different as possible from a town, and presents the aspect of natural scenery? It is true that the curvilinear shore line and the hills above the pond cannot be wholly destroyed, but they can be made stiff, hard and unnatural, to the great loss of Cambridge, as we believe. It is true that roads and paths are needed even in the most natural parks, but that is no reason for their being obtruded as if they were the essence of a park and not the mere instruments by which scenery is made accessible. A large public reservation may include within its limits roads and paths, playgrounds, picnic grounds, and even gardens and buildings; but if these mar or destroy its *landscape*, the highest possible value of the reservation, and the only advantage of a large reservation over a small one is absolutely lost.

It is because the Fresh Pond reservation presents the outline of a singularly unified, and therefore a singularly pleasing landscape, that we have ventured to address you on behalf of the preservation, restoration and development thereof.

II. PRELIMINARY REPORT ON THE LOCATION OF PARKS FOR CAMBRIDGE, DEC. 9, 1893.

The municipality of Cambridge is four and a half miles long, and from one to two miles wide. In certain important respects the city is very favorably placed. As shown by the accompanying block plan, an uncommonly large, permanent air space is found at each end of the city. On the east is a broad basin of the salt Charles River, having an area, between Craigie and Brookline bridges and inside the Harbor Commissioners' lines, of five hundred and twenty-eight acres. On the west is Fresh Pond, with an area of one hundred and fifty-five acres. Along the whole length of the southern boundary of the city stretches another permanent open space, the channel of Charles River, with an average width, between the Harbor Commissioners' lines, of three hundred feet, and an area between Brookline bridge and Cambridge Cemetery of one hundred and eighteen acres.

Here is a total of eight hundred acres of permanently open space provided by nature without cost to Cambridge. All of this area was, until lately, unavailable for purposes of public recreation, except by boats, and most of it remains so. In late years the lands about Fresh Pond have been purchased by the city for the protection of the water supply; and the Cambridge Embankment Company has pledged itself to provide the city with a stretch of public frontage upon the basin of Charles River. Elsewhere these priceless spaces still lie, like money hoarded in a stocking, yielding no return to their owners. If Cambridge is to invest money in public recreation grounds, a just economy demands that such money shall first be placed where it will bring into use for public enjoyment these now unused and inaccessible spaces with their ample air, light and outlook. All Cambridge lies within one mile of the Harbor Commissioners' lines, excepting only that part which is north of Porter's Station and Fresh Pond. In view of this fact, to let the river spaces go unused would be wilful extravagance, while to make their borders accessible will be to insure to the city a return in public health, pleasure and refreshment such as can be derived from no ordinary, contracted, inland open space. This being the state of the

case, it is our duty to recommend the purchase by the city of every purchasable portion of the river front, from Craigie bridge to Cambridge Cemetery. When this has been determined on, it will be time to consider what other well-distributed spaces may, with economy, be secured.

Having thus outlined what has seemed to us to be the logic of the situation, we submit the accompanying block plan as the sum and substance of our report. Upon this plan are shown only the boundaries of the city, the existing public open spaces, and the spaces we would propose to acquire and reserve. The drawing is only a diagram, and we have made it a diagram in order to show with the utmost possible clearness the relative areas, and the symmetry and fairness of their distribution.

We have only to add a few words concerning each of the proposed reservations, designating them by the tentative names which, for the sake of convenience, we have put upon the plan.

(1) "*The Front.*"—Between the two canals which penetrate the manufacturing district at the eastern end of the city, it is still possible to acquire a long river frontage, and because this place will be available for the recreation of the crowded population of East Cambridge, we would have this reservation possess a considerable breadth, in order to make room for children's games and other uses quite distinct from the main purposes of the purchase, which are the preservation of the view of the river basin and provisions for boating on its waters. A street should be carried southward from the junction of Bridge and Prison streets, and across the canal. From the canal Commercial Avenue is planned to run parallel with the Harbor Commissioners' line, and two hundred and fifty feet distant therefrom. The Charlesbank Reservation on the Boston side of the river is only two hundred feet wide. Our diagram suggests a reservation of the full width of two hundred and fifty feet. Beginning at Binney street, where the improved frontage ends, the length of the Reservation may be whatever the city can afford to buy. We have shown it extended eastward to the canal, or nearly fifteen hundred feet. By building sea walls in the form of bastions at the ends, and making the intervening stretch a beach, this reservation can eventually be made attractive and serviceable, at a reasonable expense.

(2) "*The Esplanade.*"—Along part of the next section of the Commissioners' line, that between West Boston and Brookline bridges, the Embankment Company is already making a public esplanade two hundred feet in width, which only needs to be connected with the two bridges just named to form one of the finest urban river fronts in the world. Here there will presumably be a continuous sea wall, with a broad promenade and a broad planting space, with a roadway which will serve as a pleasure drive and also as an approach to the buildings on the abutting estates.

(3) "*Captain's Island.*"—Just above Brookline bridge an opportunity is offered by Captain's Island and the marshes about it to make a level field, available for the sports of boys, for which a provision in this neighborhood is highly desirable.

If the driveway of the Esplanade is curved as it approaches Brookline street in such a way that it will enter upon the location of Leverett street, and then if Leverett street is followed across Magazine street, an area of some twenty-five acres will be obtained between the drive and the Harbor Commissioners' line. Even if the river shore of this

tract is beached instead of being walled, there will still remain a playing-ground for general use of twice the area of the well-known Jarvis Field of Harvard College. The River road will bound this playground on the north, and upon the Road will front buildings, the rear yards of which will be reached from the Old Marsh lane.

(4.) "*The River Road.*"—From Captain's Island to Cambridge Hospital, along the Commissioners' line, a reservation of whatever varying widths may be found most economical should be secured. The least width which should be considered at all is such as will provide a promenade upon the river wall twenty feet wide, and in addition at least another ten feet in which to plant trees and shrubs to hide adjacent fences and buildings. Entrances to such a promenade would be had at every bridge, and at the end of every street which may extend to the river. While to buy a narrow strip of flats and marsh and wharf for the purpose just described might seem to be the cheapest thing which could be done at the present time, it may well be doubted whether this would prove to be the most economical course of action in the end. To make a promenade upon so narrow a strip, a river wall would be absolutely necessary. Out of a total length of eleven thousand, five hundred and eighty feet of Commissioners' line, only two thousand two hundred fifty feet, or less than one-fifth, is walled at the present time, and much of the existing wall is cheaply and badly built. A good wall is costly, and after your commission shall have made a study of land values, it will very probably appear that it would be more economical to buy a strip one hundred feet wide in which to make a gravel beach than to undertake the building of a riverside wall. Furthermore, it may well be questioned whether, if the city is to invest any money upon the river front, it ought not to invest enough to insure a proper financial return from the investment. A promanede alone, whether it were made upon a river wall or at the top of a beach, would not appreciably enhance the attractiveness or value of the adjacent real estate. On the other hand, a roadway with a sidewalk, providing convenient and handsome access to abutting estates would enhance values considerably, and so would insure the eventual re-imbursement of the city treasury.

(5.) "*Elmwood Way.*"—When the banks of the Charles shall have been reserved by Boston as well as by Cambridge, for the development of the scheme of improvement just described, there will arise a demand for a broad connection between the Charles river reservations and the large reservation about Fresh pond. A bridge will be required in the bend of the river at Gerry's landing. From the site of this bridge, by way of Mount Auburn street and Fresh Pond lane, the distance to Fresh pond is less than a mile, and there are so few buildings on this line that a reservation for a broad parkway of varying width should not, at the present time, be expensive. For Boston and the Metropolitan district, the Charles river drive, with this proposed parkway, would furnish the pleasantest possible route to a series of places of interest and resort—among them the Soldiers' field and the Longfellow marshes where the athletic grounds of Harvard University are soon to be established, Harvard College itself, the Longfellow house and the Memorial garden, the Lowell house at Elmwood, Mt. Auburn, and Fresh pond—the last a broader sheet of water than either Chestnut Hill reservoir at the terminus of Beacon boulevard, or Jamaica pond at the end of the Muddy river parkway. We believe the present to be the time to secure an adequate breadth of way for the future making of

this desirable connection, and we presume that the land-owners along the route will be quick to see the advantage which will accrue to them from an early establishment of its lines.

For Cambridge the widening of Mount Auburn street from the angle at the Casino to a connection with the proposed parkway at Elmwood avenue would complete a southern chain of reservations extending from the river basin at the eastern end of the city to the pond at the west end. Mount Auburn street is to become the route of the Watertown electric car line and needs to be widened on that account alone. We do not suggest that the river wall required to accomplish this widening should be built at this time, but only that the necessary additional twenty-five to forty feet of width from Bath street to Elmwood avenue should be secured before it is occupied by buildings.

Acting upon these considerations we have represented on the diagram a strip along the river of a width and area such as would be required to provide; first, a sidewalk adjacent to the private property line; secondly, a driveway and, thirdly, a promenade, with a river wall where one already exists or seems to be required by reason of the expensiveness of adjacent land, and a beach along all the remaining length of the reservation. We have assumed that the immediate purpose of your Commission is simply the acquisition of such lands along the river as will make it possible to develop eventually a serviceable and handsome river front. The diagram represents our view of what is requisite for this purpose. No serious obstacles to the easy acquisition of these lands present themselves except between River street and Western avenue. Even here only one expensive building projects into the strip seventy-five feet wide, which we deem the least that should be acquired along the river wall. As respects the delivery of coal at the establishments between these bridges and at the wharves of Messrs. Rugg, and Richardson & Bacon, we do not think that this should for a moment stand in the way of the accomplishment of the Commission's purpose. For passing coal from vessels to permanent establishments which use or sell it in quantities, either light iron trestles or underground runways can be devised.

(6.) "*Rindge Field*." (7.) "*Shady Hill*" (8.) "*Binney Field*"

Omitting mention of Fresh pond, because the energy of the Water Board has already secured an ample reservation all about it, we have next to turn to the northern border of the city, where, because of the considerable distance to the river front, a few public spaces should be reserved. If the total distance from the centre of Fresh pond to the centre of the Charles river basin opposite "The Front" be divided into fourths, the Rindge field, Shady Hill, and the Binney field will be found to lie almost directly abreast of the first, second and third marks. The two spaces called fields are both well adapted to serve as playgrounds, while Shady Hill is a small oasis of idyllic rural scenery preserved in the midst of city conditions by the conservative artistic spirit of its owners in two generations. We believe that both the open fields for play and the secluded wood for rest will be worth to Cambridge vastly more than they can cost at the present time.

III. NOTES ON PRELIMINARY PLANS OF PROPOSED PUBLIC GROUNDS IN CAMBRIDGE, JANUARY 11, 1894.

"*Cambridge (Binney) Field*."—This is the largest of the three proposed interior reservations of the Cambridge park system. Its dimensions are

1005 feet in length and 520 feet in width. The plan provides for an open rectangular gravel playground for boys at the southern end, 520 feet in length and 420 feet in width, with easy access to the exterior streets between pairs of trees set in strips of turf. This playground might be flooded in winter for the use of skaters.

The northern end is occupied by a general recreation ground, consisting of a broad lawn encircled by a winding walk with seats, secluded from the exterior streets by plantations of shrubbery. In an intermediate position is placed a building for public convenience and park service, on the south side of which there may be a bandstand facing a grove of symmetrically placed trees, affording shade for an audience.

A broad mall, 20 feet in width, and bordered with shade trees and seats, extends around the entire inner boundary and the other paths are designed to provide for easy passage across the reservation.

"Rindge Field."—This reservation is of smaller area than the Binney field but of similar character. Its dimensions are 810 feet in length and 410 feet in width.

The plan provides for a gravel playground at the southern end, 550 feet in length and 356 feet in width, bordered by a walk and turf space for shade trees. This playground is of a shape suitable for a running track.

At the northern end of the playground is a building for public convenience and park service, with exterior space at one end for light gymnastic apparatus for girls, and at the other for sand courts for little children.

The remaining space is occupied by a lawn of a secluded character, separated from the exterior streets by plantations of shrubbery.

The paths are designed to afford easy passage across the reservation.

"The Front;"—This tract, the most easterly of the reservations of the proposed park system, lies upon the river front, between Binney street and the East Cambridge Commercial canal. Commercial avenue forms its rear boundary.

Given this rectangular area 1475 feet in length and 250 feet in width, the purpose of the design has been to furnish a recreation ground for the crowded population of the adjoining district, including a children's playground, boating facilities and the preservation of the river view.

The sketch plan provides for a beach occupying the southern half of the reservation, 760 feet in length and 140 feet in width, at mean low water, with a boathouse and landing at the southern corner, and a commanding bastion at the northern. The rear of the beach is bounded by a curvilinear path, with seats at intervals and connections with Commercial avenue, from which it is secluded by a plantation of shrubbery.

The northern portion of the reservation is occupied by an open gravel playground, 370 feet in length and 190 feet in width, enclosed by shade trees set in pairs in a turf strip, thus affording easy access to the street. Between the playground and Charles street is a building for public convenience and park service, concealed by shrubbery. The water front, except along the beach, is enclosed with a suitable sea wall with bastions at commanding corners.

"The Esplanade."—This reservation extends along the commissioners' line, from West Boston bridge to a point near the terminus of Putman avenue. The length of the straight Esplanade between these points is 7,275 feet and its width 200 feet.

The sketch plan subdivides the width of the Esplanade as follows: 15 feet for a sidewalk adjacent to the private building land; 10 feet for a strip of turf with trees; 30 feet for an interior roadway; 60 feet for a

central grass plot ; 40 feet for an exterior roadway ; 25 feet for a strip of turf with trees ; 20 feet for a riverside promenade.

At the north end of the Esplanade and between it and Main street is found a triangular space, which may well be put to use as a transfer station for the numerous electric car lines which traverse West Boston bridge.

"Charles River Drive."—At the south end of the Esplanade and the terminus of Putnam avenue, the straight lines of the Esplanade come to an end upon a terminal circle and the curves of the River drive begin. The Esplanade fronts upon the great basin of Charles river ; the River drive follows the meanderings of the contracted stream, and consequently is curvilinear throughout its length.

Before reaching the proposed overhead crossing of the Grand Junction railroad, the two driveways of the Esplanade are drawn into one, and the one drive then proceeds upon one long curve, past the Captain's Island playground reservation, to the point where it is forced out upon the sea wall at the commissioners' line by the buildings of the Riverside Press. At this point, the minimum width of the reservation measured inland from the commissioner's line, is seventy-seven and one-half feet, which distance is sub-divided as follows : 10 feet for a planting strip adjacent to the private land ; 40 feet for a driveway ; $7\frac{1}{2}$ feet for a strip of turf with trees, and 20 feet for a promenade. From the Riverside Press to Mt. Auburn street at the foot of Willow street the drive proceeds upon varying curves, which lie at varying distances from the commissioners' line, the sub-divisions remaining everywhere the same : namely, sidewalk, 15 feet ; planting strip, $7\frac{1}{2}$ feet ; roadway, 40 feet ; planting strip, $7\frac{1}{2}$ feet and promenade, 20 feet. Where there is sufficient space between the promenade and the commissioners' line, the shore of the tidal river may be a beach ; elsewhere, it must be either a rip-rap slope or a vertical sea-wall, as space may permit.

Mt. Auburn street is shown upon the plan as widened on the south side out to the commissioners' line, thus providing a width of forty feet for pleasure driving between the electric car tracks and the promenade. It is to be hoped that this widened Mt. Auburn street may be extended past Elmwood and Mt. Auburn to Fresh Pond.

IV. OUTLINE OF AN ARGUMENT FOR A DAM IN CHARLES RIVER, OCTOBER 15, 1894.

The argument for the construction of the proposed dam can be put into a nutshell. In the first place, the dam, by shutting out the high tide, will free the marshes of the river from daily flooding. This result will be accomplished without changing the level of the underlying ground water, so that the river lands will at once become more habitable, healthy and valuable than they have ever been.

In the second place the dam, by maintaining a permanent instead of a fluctuating water level in the river, will add much to the usefulness, the healthfulness, and the beauty of the stream itself. The channel will become navigable at all times, and vessels will not have to lie aground at wharves and landings. The flats and the slimy walls and shores will be covered forever. In summer boating for pleasure will be possible at all hours. In winter it will be possible to skate from Boston to Watertown.

In the third place, the dam will save much money in one direction, and increase wealth in another. Six hundred and sixty thousand dollars' worth of dam will make unnecessary the expenditure of several

millions for sea walls or rip-rap and filling. Compared with a tidal and walled river, a fresh water stream secured by a dam will make a far better park at less cost. Moreover, the fresh-water stream, flowing at a constant level, bordered by public roads and reservations already secured or projected, and edged by low walls about the basin, and by low bushy banks above Cottage Farm, will certainly enhance the value of all adjacent lands, and soon return to the public treasury the whole cost of the dam."

V. NOTES ON A PLAN FOR BROADWAY SQUARE, NOVEMBER 14, 1894.

This small public ground contains two and six-tenths acres. At the present time it is so cut up by cross-paths that its appearance is ruined. Neither is its present arrangement well adapted to serve the comfort of the women, children and babies who frequent the place in summer.

The accompanying plan provides convenient diagonal paths, while it preserves a considerable breath of central lawn. For the children it suggests a gravel playing space one hundred and fifty feet long, placed near the Broadway boundary, so that a sunny exposure may be had. Seats placed here under a vine-clad arbor will command the playground and the lawn, while the arbor and a dense shrubbery behind it will afford some shelter from north winds.

VI. LIST OF THE PRINCIPAL DRAWINGS PREPARED FOR THE CAMBRIDGE PARK COMMISSION.

| | | | |
|---|------------|-----------|-----------------|
| Diagram of proposed public grounds..... | 12,000 ft. | to 1 in., | Dec. 7, 1893. |
| Cambridge Field, preliminary plan..... | 100 " | to 1 " | Dec. 8, 1893. |
| The Front, preliminary plan..... | 100 " | to 1 " | Dec. 18, 1893. |
| Cambridge Field, preliminary plan No. 2..... | 100 " | to 1 " | Dec. 18, 1893. |
| Rindge Field, preliminary plan..... | 100 " | to 1 " | Dec. 22, 1893. |
| Charles River Drive, preliminary plan..... | 100 " | to 1 " | Jan. 9, 1894. |
| Alternative studies for parkway from Charles River to Fresh Pond..... | 50 " | to 1 " | March 2, 1894. |
| Study for parkway from Mt. Auburn street to Fresh Pond..... | 50 " | to 1 " | March 19, 1894. |
| Map showing proposed new bridge, across Charles River..... | 400 " | to 1 " | April 21, 1894. |
| Working drawing, Cambridge Field..... | 40 " | to 1 " | May 8, 1894. |
| Working drawing for portion of River Drive at Boylston street..... | 20 " | to 1 " | Sept. 1, 1894. |
| Sketch showing how River Drive may pass Riverside Press..... | 20 " | to 1 " | Sept. 29, 1894. |
| General plan, Cambridge Field..... | 40 " | to 1 " | Oct. 25, 1894. |
| General plan, Esplanade and River Drive..... | 400 " | to 1 " | Oct. 30, 1894. |
| General plan, Broadway Square..... | 20 " | to 1 " | Nov. 13, 1894. |

There being now good prospect of the eventual building of a dam in Charles river, substantially as recommended by the State Board of Health and the Metropolitan Park Commission, we have had drawn for transmission with this letter a sketch plan of the Charles River Drive, as it may be arranged when the dam is secured, the high tide kept out, and the surface of the stream maintained at a constant level. If the dam is built near Craigie bridge the shores of "The Front," "The Esplanade," and whatever promenade may be built on the Boston side, may be low walls, very different from the costly structure which bounds the present "Charlesbank." If the dam is not built, high walls, rip-raps or beaches one hundred feet wide must border the river all the way up to Watertown. On the other hand, if the dam is built either

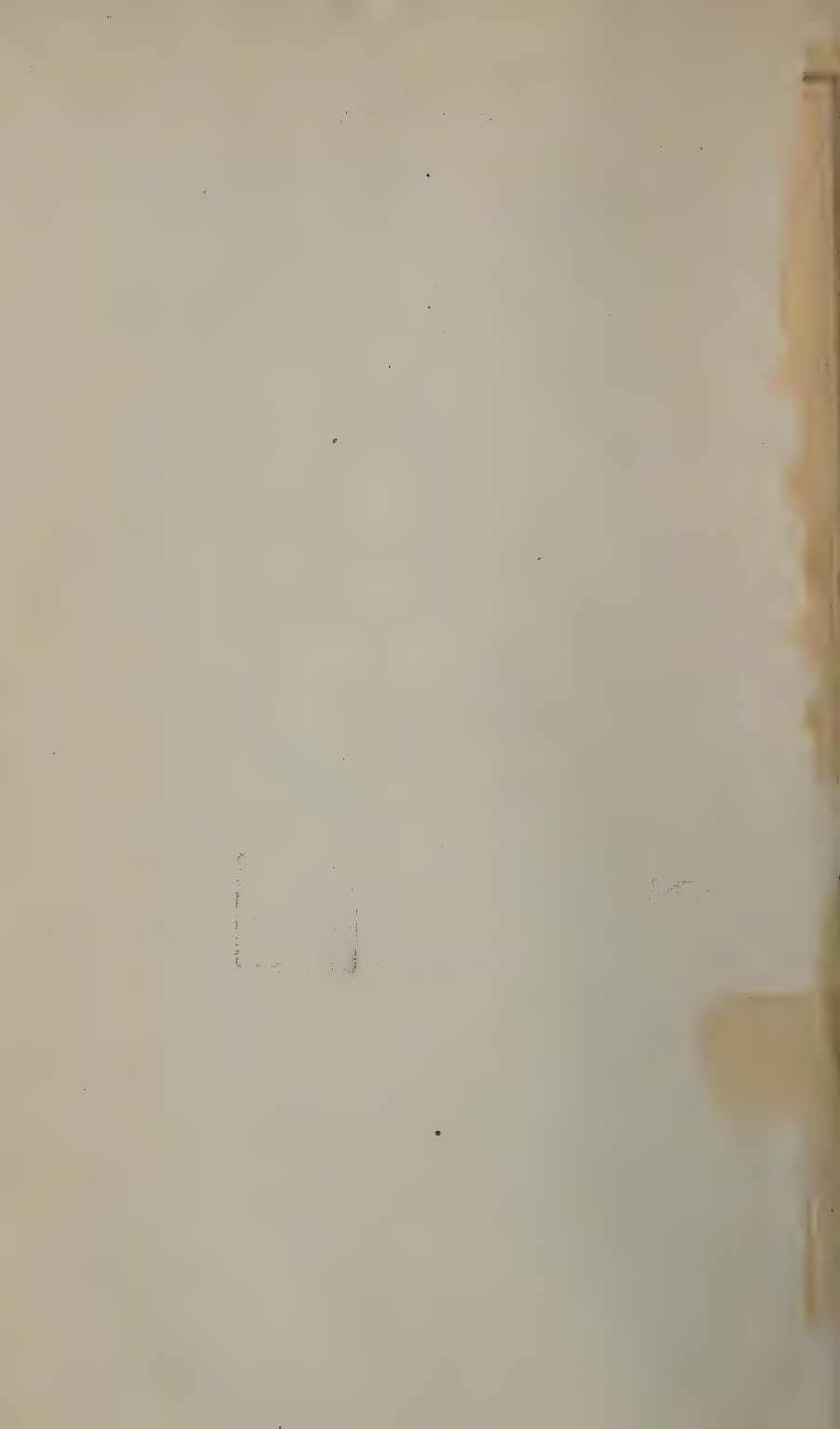
at Craigie bridge or at Cottage Farm, the banks of the narrow river may soon and at comparatively slight cost take on the appearance which is suggested by the accompanying drawing.

It is obvious that it will be wisest to postpone the treatment of the actual shore of the Cambridge riverside reservations until after the question of the dam shall have been determined. Meanwhile, there is no need that the construction of the sidewalk, planting strip and roadway of the River Drive should be delayed.

Respectfully submitted,

OLMSTED, OLMSTED & ELIOT.

BROOKLINE, 29 Oct., 1894.



REPORT OF THE CITY ENGINEER.

CITY OF CAMBRIDGE,
OFFICE OF CITY ENGINEER, }
CITY HALL, December 1, 1894. }

Henry D. Yerxa, Esq., President Park Commission.

The engineering work in connection with the Park Department the past season has so far been largely of a preliminary and miscellaneous character.

The land bordering the Charles River having been taken for Park purposes on January 25, 1894; a party was placed on the work of making detailed surveys, soundings and plans of the lands so taken.

Two assistants and a helper, in charge of Mr. Charles B. Parker have been almost constantly employed on this work since April, 1894.

The Harbor Commissioners lines and the shore line of the river have been located, from near the Cambridge Hospital to Brookline bridge, and soundings on the flats from the shore line to below mean low water line have been taken over most of this distance. Numerous plans and miscellaneous surveys have been made of the other parts of the park system.

Seventy-eight descriptions of lands taken have been made, and various estimates for work and materials prepared.

Much of the park lands have been plotted on a large scale, as working plans, so that it will be comparatively easy to lay out work on any part of the park land.

The work of the Water Board at Waltham and Lincoln in constructing a large storage basin will necessitate the stripping and wasting of large quantities of loam which at some no distant day will be likely to be needed by the Park Department in surfacing and seeding the park lands.

From preliminary estimates obtained from contractors it seems that the cost of transportation and delivery will not be excessive. By laying a spur track from the Fitchburg Railroad to the site of the Storage Basin the loam can be transported entirely by rail to points at or near the park lands. If the right of way can be secured on which to lay the spur track it would be an exceedingly favorable opportunity to secure the very large quantity of loam which otherwise it might be difficult to obtain.

Very respectfully yours,

L. M. HASTINGS,
City Engineer.

STATUTES AND ORDINANCES

RELATING TO THE

PARK DEPARTMENT.

CITY OF CAMBRIDGE,
IN COMMON COUNCIL, March 29, 1892. }

Ordered: That His Honor the Mayor be requested to petition the General Court now in session for the passage of an Act authorizing the city to borrow, outside of its debt limit, a sum not exceeding two hundred thousand dollars, for the purpose of purchasing and improving lands within the city limits for play grounds and parks for the use of its inhabitants.

Read once and laid on the table.

April 5, 1892, taken from the table and amended by adding thereto the following:—

And further authorizing the city to take, maintain and hold in fee or otherwise, and by gift upon such conditions as the City Council may deem advisable, or by purchase or otherwise, for the purpose of play-grounds and parks, such lands with any structures that may be thereon, within the city limits as it may from time to time deem suitable."

Passed in Common Council. Came up for concurrence. Read and concurred.

Approved by the Mayor, April 13, 1892.

COMMONWEALTH OF MASSACHUSETTS.

(Chapter 341.)

In the year one thousand eight hundred and ninety-two, "An Act to Authorize the City of Cambridge to lay out and maintain Public Parks." Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:—

SECTION 1. The City of Cambridge, by its City Council, at any time within three years after the passage of this Act, may take, hold, by purchase or otherwise, any and all such real estate and lands within said city as it may deem advisable, and may lay out, maintain and improve the same as a public park or parks.

SECT. 2. The said city shall, within sixty days after the taking of any lands and real estate as aforesaid, otherwise than by purchase or gift, cause to be recorded in the registry of deeds for the southern dis-

trict of the county of Middlesex a description thereof sufficiently accurate for identification, with a statement of the purposes for which the same were taken, which statement shall be signed by the Mayor.

SECT. 3. Said city shall be liable to pay all damages sustained by any persons or corporations by the taking of, or injury to, any of their land, real estate or property, for the purposes aforesaid. If any person sustaining damage as aforesaid does not agree with said city upon the amount of said damage, he may, within one year from such taking, and not afterwards, apply by petition for an assessment of the damage to the Superior Court in said County of Middlesex. Such petition may be filed in the clerk's office of said court, and the clerk shall thereupon issue a summons to the said city, returnable on the first Monday of the next month after the expiration of fourteen days from the filing of the petition, to appear and answer to the petition. The summons shall be served fourteen days at least before the day at which it is returnable, by leaving a copy thereof, and of the petition, certified by the officer who serves the same, with the clerk of said city; and the court may, upon default of hearing of said city, appoint three disinterested persons who shall, after reasonable notice to the parties, assess the damages, if any, which such petitioner may have sustained as aforesaid, together with interest at the rate of four per centum per annum from the date of the actual entry and taking possession of by said city. And the award of the persons so appointed or a major part of them being returned into and accepted by the court shall be final, and judgment shall be rendered and execution issued thereon for the prevailing party, with costs, unless one of the parties claims a trial by jury, as hereinafter provided.

SECT. 4. If either of the parties mentioned in the preceding section is dissatisfied with the amount of damage awarded, as therein expressed, such party may, at the sitting at which such award was accepted, or next sitting thereafter, claim in writing a trial in said court, and have a jury to hear and determine at the bar of said court all questions of fact relating to such damages, and to assess the amount thereof with interest as aforesaid; and the verdict of the jury being accepted and recorded by the court shall be final and conclusive, and judgment shall be rendered and execution issued thereon, and costs shall be recovered by the parties, respectively, in the same manner as is provided by law in regard to proceedings relating to the laying out of highways.

SECT. 5. In every case of a petition to the Superior Court for an assessment of damages as provided in this Act, the said city may tender to the petitioner or his attorney any sum, or may bring the same into court to be paid to the petitioner, for the damages by him sustained or claimed in his petition, or may in writing offer to be defaulted and that damages may be awarded against it for the sum therein expressed; and if the petitioner does not accept the sum so offered and tendered, with his costs up to that time, but proceeds with his suit, he shall be entitled to his costs to the time of such tender or payment into court, or offer of judgment, and shall not be entitled to either costs or interest afterwards, unless the amount recovered by him in such action exceeds the amount so tendered.

SECT. 6. At any time within two years after any land is taken or purchased for a park or parks under this Act, the Board of Aldermen of said City of Cambridge, if in its opinion any real estate in said city receives any benefit and advantage from such taking or purchasing, or from the locating and laying out of a park or parks under this Act,

beyond the general advantages to all real estate in said city, may adjudge and determine the value of such benefit and advantage to any such real estate, and may assess upon the same a proportional share of the cost of land so purchased or taken, and of the expense of laying out, grading and making such park or parks; but in no case shall the assessment exceed one-half of the amount of such adjudged benefit and advantage. Said real estate subject to such assessment may include the remainder of the land of which a part is taken for said public park or parks, and real estate which does not abut upon the park, from the laying out of which the betterments accrue, or upon a street or way bounded upon such park.

SECT. 7. Assessments made under the preceding section shall constitute a lien upon the real estate so assessed and shall be collected and enforced, with the same rights to owners to surrender their estates, and the same proceedings thereupon, and with the same rights of and proceedings upon appeal, as are provided by Chapter fifty-one of the Public Statutes.

SECT. 8. For the purpose of defraying the cost of such real estate and lands as may be purchased, taken or held for the purposes aforesaid, and of constructing the park or parks authorized by this Act, and paying all expenses incident thereto, the City Council of Cambridge shall have authority to issue, in excess of the limit allowed by law, scrip or bonds to be denominated on the face thereof, Cambridge Park Loan, to an amount not exceeding two hundred thousand dollars, bearing interest not exceeding four and one-half per centum per annum, payable semi-annually, the principal to be payable at periods of not more than thirty years from the issuing of such scrip or bonds respectively. Said City Council may sell the same or any part thereof from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value thereof. The provisions of the tenth and eleventh sections of Chapter twenty-nine of the Public Statutes shall, as far as applicable, apply to this Act.

SECT. 9. If the City of Cambridge shall accept the provisions of Chapter one hundred and fifty-four of the Acts of the year eighteen hundred and eighty-two, and Acts in amendment thereof, then all lands and real estate which may be taken by virtue of this Act shall be under the care and management of the Board of Park Commissioners of said city authorized to be appointed by virtue of said Act.

SECT. 10. This Act shall take effect upon its acceptance by the City Council of Cambridge. (Approved, June 2, 1892.)

CITY OF CAMBRIDGE, }
IN BOARD OF ALDERMEN, February 21, 1893. }

Ordered: That the Mayor be and hereby is requested to petition in the name and behalf of the City of Cambridge, to the General Court, at its present session, for such further amendments to Chapter 341 of the Acts of the year 1892, in addition to amendments already petitioned for, which petition is now pending before the Legislature, as will enable the City to borrow for park purposes outside of its debt limit, the sum of \$300,000, in addition to the amount allowed to be so borrowed by said Act.

Sent down for concurrence, February 21, 1893.

In Common Council, February 21, 1893, concurred.

Approved by the Mayor, February, 23, 1893.

COMMONWEALTH OF MASSACHUSETTS.

[Chap. 337.]

In the year one thousand eight hundred and ninety-three, "An Act relative to Public Parks in the City of Cambridge." Be it enacted by the Senate and House of Representatives in General Court assembled, and by authority of the same, as follows:—

SECTION 1. Section one of chapter three hundred and forty-one of the acts of the year eighteen hundred and ninety-two is hereby amended by striking out in the second line, the words "within three years," by inserting in the fifth line, after the word "advisable," the words: "Upon the recommendation of the Board of Park Commissioners hereinafter mentioned," and by adding at the end thereof the words: "The fee of such real estate and lands shall vest in said city," so as to read as follows:—*Section 1.* The City of Cambridge, by its City Council, at any time after the passage of this Act, may take and hold, by purchase or otherwise, any and all such real estate and lands within said city as it may deem advisable, upon the recommendation of the Board of Park Commissioners hereinafter mentioned, and may lay out, maintain and improve the same as a public park or parks. The fee of such real estate and lands shall vest in said city.

SECT. 2. Section eight of said chapter is hereby amended by striking out in the ninth line, the word "two," and inserting in place thereof the word "five," so as to read as follows:—*Section 8.* For the purpose of defraying the cost of such real estate and lands as may be purchased, taken or held for the purposes aforesaid, and of constructing the park or parks authorized by this Act, and paying all expenses incident thereto, the City Council of Cambridge shall have authority to issue, in excess of the limit allowed by law, scrip or bonds to be denominated on the face thereof, Cambridge Park Loan, to an amount not exceeding five hundred thousand dollars, bearing interest not exceeding four and one-half per centum per annum, payable semi-annually, the principal to be payable at periods of not more than thirty years from the issuing of such scrip or bonds respectively. Said City Council may sell the same or any part thereof from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value thereof. The provisions of the tenth and eleventh sections of chapter twenty-nine of the Public Statutes shall, so far as applicable, apply to the act.

SECT. 3. Said city may make rules for the use and government of such park or parks, and for breaches of such rules affix penalties, not exceeding twenty dollars for one offence, to be imposed by any court of competent jurisdiction; may appoint a police force to act in such parks, and generally may do all acts needful for the proper execution of the powers and duties granted to or imposed upon such city by this act and said chapter; *provided, however,* that no land shall be taken, or any other thing involving an expenditure of money be done under this Act or said chapter until an appropriation sufficient to cover the estimated expense thereof shall have been made by a vote of two-thirds of each branch of the city council; and such expenditures shall in no case exceed the appropriations made therefor, and all contracts made for expenditures beyond the amount of such appropriations shall be void.

SECT. 4. All the rights, powers and authority given to the City of Cambridge by this Act and by said chapter, except for the taking of land and assessment of betterments, shall be exercised by said city, subject to all duties, liabilities and restrictions herein contained, through a board of persons to be appointed by said city, who shall be styled Park Commissioners.

SECT. 5. Section nine of chapter three hundred and forty-one of the Acts of the year eighteen hundred and ninety-two is hereby repealed.

SECT. 6. This act shall take effect upon its acceptance by the City Council of Cambridge. [Approved May 12, 1893.]

The above Act was accepted by the City Council, June 7, 1893.

CITY OF CAMBRIDGE.

In the year one thousand eight hundred and ninety-four.

AN ORDINANCE IN AMENDMENT OF CERTAIN CITY ORDINANCES.

Be it ordained by the City Council of the City of Cambridge, as follows:—

The Revised Ordinances of 1892 are hereby amended in the following Chapters, viz.:

In Chapter 1, Section 9. By striking out the words "Superintendent of Streets," in the third line, and inserting in place thereof the words "park commissioners or the water board."

In Chapter 24, Section 2. By striking out in the third line the word "commons," and in the fourth line the words "and inclosures"; also by inserting in the third line after the word "bridges" the word "and."

In Chapter 24, Section 3. By striking out the entire section.

An ordinance establishing a Park department, approved July 11, 1893, is hereby amended by inserting in Section 8, second line after the word "to," the words "the trees in the public streets and," and by adding the following sections, viz.:

Sect. 10. The Park Commissioners, in addition to the general care and charge of parks and public grounds imposed upon them by the foregoing provisions, shall have the general care and charge of all the other commons, public grounds and enclosures now belonging, and as the same may hereafter belong to the city, and not under the general care of the Water Board.

Sect. 11. The Park Commissioners shall have the care of the trees in the public streets. They shall cause all statutes and ordinances made for the protection of said trees, the commons and other public grounds and enclosures not under the general care and charge of the Water Board, to be strictly enforced, and shall institute legal proceedings against all persons violating such statutes and ordinances.

As amended the sections of Chapters 1 and 24 of the Revised Ordinances of 1892, before mentioned, and the ordinance establishing a Park Department, will read as follows:

(REVISED ORDINANCES of 1892.)

Chapter 1. Section 9. The words "public grounds" shall include the commons and all public lands placed by the City Council under the

charge of the Park Commissioners or the Water Board, and those parts of public places which do not form travelled parts of highways.

Chapter 24, Section 2. The superintendent of streets shall, under the direction and control of the mayor, have the general care and charge of the highways, streets, bridges and public squares belonging to the city, and shall attend to the making, mending and alteration thereof, and cause the same to be kept in good repair, so as to be safe and convenient for travellers with their horses and carriages at all seasons of the year. He shall place suitable street signs on each street at convenient distances apart. He shall keep the entrances to the catch-basins open and clear of ice in cold weather, so as to permit the flow of surface water into them. He shall see that the highways, streets and sidewalks are kept in good order, and that all nuisances and obstructions therein are forthwith removed, or give notice thereof to the mayor or chief of police. And in case of the blockade or obstruction of any street, the person causing such blockade or obstruction shall forthwith notify the superintendent of streets and the chief of police thereof.

Section 3 (stricken out).

AN ORDINANCE ESTABLISHING A PARK DEPARTMENT.

Be it ordained by the City Council of the City of Cambridge, as follows:—

Section 1. The Park department shall be under the charge of a board of three persons, to be styled Park Commissioners, who shall be appointed by the Mayor, subject to the confirmation of the Board of Aldermen, and they shall hold their offices until the expiration of terms of one, two and three years respectively, from the first day of May, 1893. The Mayor shall, subject to like confirmation, before the first day of May in each year after the year 1893, appoint a commissioner to continue in office for the term of three years from said day. No person shall be a commissioner who is at the same time a member of the City Council. Any vacancy occurring in the said board shall be filled for the residue of the term of the commissioner whose place is to be filled, in the same manner in which such commissioner was originally appointed. Said commissioners shall, in addition to the above term, hold office until others are appointed in their respective places.

Sect. 2. The President of the Park Commissioners shall be elected by the Board, and shall be one of the persons appointed as provided in the first section of this chapter. The Board may make such rules and regulations for its own government, and in relation to its officers, as may be deemed expedient.

Sect. 3. The Board so constituted shall have and exercise all the rights, powers and authority given to it and to the City Council by the Legislature, by the three hundred and forty-first chapter of the acts of the year eighteen hundred and ninety-two, and by the three hundred and thirty-seventh chapter of the acts of the year eighteen hundred and ninety-three, and by any acts in addition to either of said acts which may hereafter be enacted, so far as the same can be legally delegated by the city, subject to all the duties, liabilities and restrictions in said last named chapter contained. Said commissioners may in their discretion annually appoint a superintendent, a clerk, and all other subordinate agents and assistants, who shall be removed at their pleasure, and fix their compensation subject to the approval of the committee on finance.

Set. 4. The Board, on or before the fifteen day of December in each year, shall present to the City Council a report containing a statement

of the condition of all the parks and lands under its control or supervision, and of other property connected therewith, with an account of all receipts, and expenditures, together with any information or suggestions which it may deem important; and if a superintendent has been appointed, it shall at the same time transmit to the City Council his report.

SECT. 5. The Board may sell such of the personal property connected with said parks or lands as it may deem expedient, subject to the approval of the Mayor.

SECT. 6. The President of the Board shall exercise a general supervision over all said parks and lands, and the materials and property connected therewith, and over all subordinate officers and agents. In case of his absence or disability, his duties may be performed by a president pro tempore, to be chosen by the Board.

SECT. 7. No member of the Board, and no person appointed to any office or employed by virtue of this chapter or of the Acts of the Legislature mentioned in the third section of this chapter, shall be interested, directly or indirectly, in any contract, bargain, sale or agreement, in relation to said parks or lands, or any matter or thing connected therewith, wherein the city is interested; and any and all contracts, bargains, sales or agreements, made in violation of this section, shall be void as to the city.

SECT. 8. The superintendent shall perform all such services in relation to the trees in the public streets and said parks and lands as may be required of him by the board, and he shall annually, during the first week of December, present to the Board a report of the general condition of said parks and lands.

SECT. 9. The Board may require the City Engineer, either by himself or by his assistants, to perform all work which properly comes within the province and under the direction of a civil engineer, including the making of examinations and surveys, the preparation of statements, plans, profiles, estimates, descriptions, specifications and contracts, and the measuring of the work done by contract and certifying to the results of such measurement.

SECT. 10. The Park Commissioners, in addition to the general care and charge of parks and public grounds imposed upon them by the foregoing provisions, shall have the general care and charge of all the other commons, public grounds and enclosures now belonging, and as the same may hereafter belong to the city, and not under the general care of the Water Board.

SECT. 11. The Park Commissioners shall have the care of the trees in the public streets. They shall cause all statutes and ordinances made for the protection of said trees, the commons and other public grounds and enclosures not under the care and charge of the Water Board, to be strictly enforced, and shall institute legal proceedings against all persons violating such statutes and ordinances.

In Common Council, March 6, 1894.

Passed to be ordained.

In Board of Aldermen, March 6, 1894.

Passed to be ordained.

March 13, 1894. Approved by the Mayor.

CITY OF CAMBRIDGE, }
IN BOARD OF ALDERMEN, }
January 23, 1894. }

Ordered: That His Honor the Mayor be authorized to petition the

General Court in the name and on behalf of the City of Cambridge for authority to borrow for park purposes, a sum not exceeding \$100,000 a year for five years, beginning in the year 1895.

Sent down for concurrence Jan. 23, 1894, concurred, Jan. 25. Approved.

COMMONWEALTH OF MASSACHUSETTS.

[CHAP. 89, OF THE ACTS OF 1894.]

AN ACT TO AUTHORIZE THE CITY OF CAMBRIDGE TO MAKE AN ADDITIONAL PARK LOAN.

Be it enacted etc., as follows:—

SECTION 1. The City of Cambridge, by its city council, is hereby authorized to issue, in excess of the limit allowed by law, scrip or bonds to be denominated on the face thereof, Cambridge Park Loan, to an amount not exceeding one hundred thousand dollars each year for five years, commencing in the year eighteen hundred and ninety-five, bearing interest not exceeding four per centum per annum, payable semi-annually, the principal to be payable at periods of not more than forty years from the issuing of such scrip or bonds respectively. The proceeds of said loans shall be used in settling unpaid damages for property purchased, taken or held, and which hereafter may be purchased, taken or held, for a public park or parks, as authorized by chapter three hundred and forty-one of the acts of the year eighteen hundred and ninety-two, and by chapter three hundred and thirty-seven of the acts of the year eighteen hundred and ninety-three, and any and all acts amendatory thereof and supplementary thereto; for constructing, completing and maintaining said park and parks; and for any and all other purposes connected with and incident to the protection, renewal, enlargement, adornment and construction of a public park or parks in said city of Cambridge. Said city council may sell said scrip or bonds, or any part thereof, from time to time, or pledge the same for money borrowed for the above purposes; but the same shall not be sold or pledged for less than the par value hereof.

SECTION 2. The provisions of the tenth and eleventh sections of chapter twenty-nine of the Public Statutes shall, so far as applicable, apply to said loan.

SECTION 3. This act shall take effect upon its passage. [*Approved March 9, 1894.*]

TABLE OF CONTENTS.

| | PAGE. |
|---|-------|
| REPORT OF BOARD OF PARK COMMISSIONERS. PART ONE . . . | 3 |
| I. <i>Park Construction</i> | 11 |
| Cambridge Field | 11 |
| Rindge Field | 12 |
| Rindge Field Nursery | 12 |
| East Cambridge Embankment | 13 |
| The Esplanade | 13 |
| Captain's Island Playground and River Road | 13 |
| II. <i>Squares and Public Grounds</i> | 13 |
| Dana Square | 13 |
| Broadway Park | 14 |
| Hastings Square | 14 |
| Fort Washington | 14 |
| Cambridge Common | 14 |
| Winthrop Square | 15 |
| Public Grounds | 15 |
| Shade Trees | 16 |
| III. <i>Related Matters</i> | 16 |
| Boylston Street | 16 |
| Building Lines | 17 |
| Sidewalks | 17 |
| Poles and Wires | 17 |
| Bridges | 18 |
| IV. <i>Financial Report</i> | 18 |
| REPORT OF BOARD OF PARK COMMISSIONERS. PART TWO . . . | 23 |
| <i>Proposed Damming of Charles River</i> | 23 |
| Letter from E. D. Leavitt | 25 |
| Treatment of the River Banks | 27 |
| Scour of the River | 27 |
| Sanitary Effects | 29 |
| <i>Report of Asa M. Mattice</i> | 33 |
| Description of Sewerage System | 33 |
| Sewerage Pollution | 36 |
| Camparison with the Schuylkill River | 44 |
| Comparison with Mystic Lake | 46 |
| Future Sewerage | 47 |
| Decrease of Tidal Scour | 48 |
| Loss of the Cool Tidal Flow | 55 |
| Effect on Commerce | 58 |
| Cost of Dam | 60 |
| Basin as a Naval Rendezvous | 62 |
| Re-opening Charlestown Navy Yard | 65 |
| Improved Railroad Facilities | 66 |
| The Teredo Navallis | 68 |
| The Massachusetts State Board of Health | 68 |

| | |
|---|-----|
| REPORT OF THE GENERAL SUPERINTENDENT OF PARKS | 71 |
| Shade Trees | 71 |
| Superfluous Trees | 78 |
| The Washington Elm | 79 |
| Work on Insects | 80 |
| Tree Gnawing | 82 |
| The Nursery | 83 |
| Cambridge Common | 84 |
| Dana Square | 87 |
| Broadway Park | 88 |
| Hastings Square | 89 |
| Dr. Paige's Suggestions | 89 |
| Winthrop Square | 91 |
| Fort Washington | 92 |
| City Hall Grounds | 92 |
| Library Grounds | 93 |
| Park Manners | 93 |
| Condition of School house Grounds | 96 |
| Cambridge Field | 97 |
| REPORT OF LANDSCAPE ARCHITECTS | 99 |
| Letter about Fresh Pond | 99 |
| Preliminary Report of Dec. 9, 1893 | 100 |
| Notes on Preliminary Plans | 103 |
| Outline of Argument for Damming Charles River | 105 |
| Broadway Square | 106 |
| List of Drawings prepared | 106 |
| REPORT OF CITY ENGINEER | 109 |
| STATUES AND ORDINANCES | 111 |



